THE

ELECTRICAL REVIEW.

VOL. LXIV. FEBRUARY 26, 1909. No. 1,631.

ELECTRICAL REVIEW.

Vol. LXIV.] CONTENTS: February 26, 1909. [No. 1,631.

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Published every FRIDAY Price 4d.

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OFFICE:—4, LUDGATE HILL, LONDON, E.C.

Telegraphic Address: "AGREKAY, LONDON." Code, A B C.

Telephone Nos. Holborn 963 Central 4425 (Editorial only).

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FOREIGN AGENTS.—New York: D. VAN NOSTRAND, 23, Murray Street. TORONTO, ONT.: WM. DAWSON & SONS, LTD., Manning Chambers. Paris: BOYVEAU & CHEVILLET, 22, Rue de la Banque. Berlin: ASHER & Co., Unter den Linden.

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THE

UNIVERSAL ELECTRICAL DIRECTORY

(J. A. BERLY'S).

1909 EDITION

H. ALABASTER, GATEHOUSE & CO.,

4, Ludgate Hill, London, E.C.

CONSULTING ENGINEERING AND THE MAINTENANCE OF PLANT.

THE position of the consulting engineer has been discussed long and often, and in some cases a certain amount of acrimony has been introduced into the debate which is not altogether desirable in the interests of a dispassionate verdict. One of the vital points in regard to the matter, is the fact, which if altered we should all deplore, that electrical engineering is advancing with very rapid strides. That being so, it is inevitable that certain men, by the force of circumstances, or their own ability, know more about a certain phase of progress at a particular time than other men. Moreover, it is evident that capitalists seeking the best return for their money will retain such men to give them the guidance necessary in formulating a novel scheme, and to these men, whether they are recruited from the college, the factory or the generating station, all the varied interests in constructional work must be subservient. It is the essential feature of a successfully conducted large enterprise, whether it be a war, an Act of Parliament, or a new dock, that some central point should be fixed as the focus of reference. The man at that point, though only a man, is invested with extra powers of obtaining intelligence and delivering opinions, that other men, perhaps intrinsically as brilliant, have not. His decision must be final.

In this way, despite the growing tendency of large firms to keep on their staff men who are undoubtedly specialists, and who can upon emergency undertake general control, there will be with us, so long as electrical engineering advances, those men whose stock-in-trade is their knowledge, who are not backed by a manufacturing interest, and whose existence is only maintained so long as their advice continues to be sound. These men are the much discussed consulting engineers.

This is the theory of the matter. The construction of suitable mechanism for upholding the consultant in his proper place so long as he performs his duties, and of deposing him therefrom as soon as he becomes useless or dangerous, is a much more serious matter. The electrical engineering fraternity has, for a considerable time, been exercising itself hugely as to how a suitable tariff for charging electricity supply can be devised to meet all conditions of load factor and class of consumer with due regard to high science. Incidentally, no finality has been reached, and a swing of the pendulum appears to be setting in, if one may judge by the increased readiness to discuss simplified metering systems. But how is it that, with this scientific predisposition, no one has, for example, read a paper before the Institution of Electrical Engineers on the Development of a Sliding Scale for the Payment of Consulting Engineers? Does it not seem rather remarkable that in many instances, not only in electrical, but in other forms of engineering, the consultant receives his payment as a percentage upon capital cost incurred? Consulting engineers are essentially an honourable class, and would allow no one to charge more for a particular piece of work than the circumstances of the case legitimately and honestly permit, but there is such a thing as engineering enthusiasm—an enthusiasm which permits itself to spend capital on refinements which a cold-blooded consideration of revenue derivable would not altogether justify. The tendency of a 5 or 10 per cent. payment on capital expenditure is not to moderate, but rather to fan such enthusiasm, and the result may easily be an engineering triumph saddled with a capital prohibiting respectable dividends.

It is not every undertaking that can draw a definite line between its constructional and maintenance stages. Indeed, in any concern which is of an expansible nature, its very success is evidenced by the retention of its consulting engineer for fresh development. But there are cases in which a day comes when a final account for the erection can be rendered, and the fees due to the consulting engineer can be ascertained. Would it not be advisable to include some sort of clause in the agreement to make it obligatory for the consultant to stand by his work for a term of years, and to take payment in whole or in part on the results of its operation? To do this would necessarily mean that the operation and maintenance of the plant would be under the supervision of the consulting engineer, and he would have powers to appeal against any course that was persisted in regardless of his advice. Many industrial undertakings would object to an outside man gaining an intimate working knowledge of their concerns, but on the other hand, many people would welcome such a supervision by a skilled man as tending to increased value of services when extensions come to be made. The chief complaint to this system would probably be from the consulting engineers themselves, who might view with concern the prospect of having to "live with" the plant which, after all, they had not made. But some arrangement on the same basis as an engine contract, in which a bonus is paid if the steam consumption comes below a certain minimum after, say, three months' run, would surely be regarded by all concerned as an equitable arrangement. As a matter of fact, unless our information is incorrect, a system such as this in its general principles has been tried by a consulting engineer interested in colliery equipments with, we believe, useful results. Whether this is so or not, it would surely be worth the while of some of our younger consultants with their reputations to make, to "back their opinion" to the extent of being paid a handsome percentage on the success with which the maintenance of the plant which they have recommended is carried out.

The Dublin Failure.

Since 1903 the Dublin rates have been called upon to the extent of £52,000, to keep the electricity department alive, and the time having arrived when, in the course of a limited company's career, compulsory liquidation would be in order, a report has been drawn up by the City Accountant and the City Treasurer in which the serious state of affairs is admitted. That report is a great deal more candid and sincere than we have become used to expect in such circumstances, and the authors have displayed an amount of energy and ability which is highly commendable.

It appears that the disastrous results of the last year's trading are attributed largely to the metal-filament lamp, and we are prepared to admit the probability of that statement; but one year's misfortune should not cause such a *débâcle* as we have presented to our view, if the business were in any way sound; nor does it excuse the previous accumulated deficit of £48,000.

The very nurses of the undertaking overstrained it, and undermined its constitution permanently, for they placed the power station at the mouth of the Liffey instead of utilising an available site almost in the centre of the city. This has added £36,000 to the capital, of which £20,000 is represented by H.T. trunk cables. This policy has involved the addition of three shifts of engineers and assistants who are required for the receiving sub-station. The annual unnecessary expenditure is £2,790, which would go a long way towards balancing the loss on last year's working. The violent controversy over the "Pigeon House Fort" site will be within the recollection of our readers.

The remedies proposed are drastic, and savour of repudiation too much for our liking.

It is legitimate but deplorable to raise the price of the unit by ½d. to private consumers, and little can be said on moral grounds to the withdrawal of the rebate of 25 per cent. on the first year's bills of new customers, but the motor-users of Dublin will have great cause for dissatisfaction if effect is given to the proposal to rescind the resolution to reduce the power rate to 1½d., which was to come into force on April 1st this year. The date has an ominous significance!

The motor rate at present averages about 1·33d. throughout the year, and in all probability many motor connections were caught with the bait of the coming reduction.

We are glad to note that the Lighting Committee have issued a report in which they take exception to this recommendation, and make out that the necessary revenue increase can be obtained without breaking faith with the consumers in this manner.

Another proposition made by the authors of the first report is that the scale of charges should be narrowed, and anyone who has seen the present scale will feel that nothing but good can come of its abolition. Not only is the maximum demand system in force, but a dozen flat rates tempered by all kinds of modifications are thrown at the prospective consumer. We believe, however, that the Committee will try to cling to its monstrous creation, in spite of the representations of business men in and out of the Corporation service, and in spite of the acknowledged failure of complicated systems in other parts of the kingdom.

We hope sincerely that the ratepayers of Dublin will emerge from their present difficulties before next year, but we have no hope that they will benefit financially from their electrical department for much longer than that.

What a sorry thing it is to see a business wilting and dying, which, in business hands, might have earned fair dividends, and under no circumstances would be a drain on the incomes of the ratepayers. What pride can there be in a business bolstered up, artificially fed, dosed with oxygen, that it may live to plague further its doctors?

It passes our comprehension to realise how men and ratepayers can be beguiled to think that municipal ownership under such conditions as these is for the common weal.

After five years, a positive loss of £52,000; a generating station in the wrong place; a redundant distributing sub-station; miles of unremunerative distributors; £1,300 to the credit of depreciation on a capital of half a million; a tariff which is higher than the average for an undertaking of similar size; and a not too creditable system of arc lighting.

How poorly those results compare with the private enterprises which provide the gas lighting and tramways—enterprises which have not only had to pay their own way and make profits for their shareholders, but have been the chief, if unwilling, instruments in supplying life-blood for the Electricity Department.

The gas company is hit the more sorely in this because it is participating actively in competition against its own vital interests; but the tramway company must be more deeply chagrined year by year to feel that it was not allowed to supply electricity for lighting and power as well as for its own tramways. The difference in the load factors cannot be held wholly responsible for the works cost per unit being four times greater in the Corporation works than it is in the tramway company's station.

One of the first paragraphs of the Report strikes the true municipal key-note. We quote from it: "In the foundation of a great undertaking of this kind, its ultimate profit bearing capacity could only be created by concessions of rates for current which would secure the citizens' support. The Lighting Committee had in this to contend with a company which had for many years enjoyed a monopoly for the supply of light in the City and suburbs, and we conceive it to have been essential to the final successful development of the undertaking that the price charged for electricity should approximate to a rate which would compete with gas."

If the department's trading had been successful after the first two or even three years, we suppose that the brazen iniquity of the policy outlined above would have been less marked, but, as matters stand at present, there is no shadow of excuse for the attempt to cripple one of the most prosperous commercial institutions of the City at the expense of the City in general and of the gas company in particular. This is the negation of trade and of morals. All right-thinking men must regret the extravagance and the slackness which too often accompany such public "enterprises," and which have in this case re-acted rather more quickly than usual.

INSULATION AND WIRING.

By W. H. F. MURDOCH, B.Sc.

Reading the revised regulations of the Institution of Electrical Engineers, one notices the following tests for insulation of wires: Class A, consisting of vulcanised rubber, is to withstand a pressure of 2,000 volts at a frequency of 50 for half an hour after the insulated conductor has been immersed in water for 24 hours, and *while it is immersed.*

Class B, which is insulating material easily destroyed by dampness, is to be tested with one minute's electrification at 500 volts *after the conductor has been immersed in water for 24 hours.*

Flexible wire is to be tested at a pressure of 1,500 volts alternating of frequency 50 for 15 minutes, *after 24 hours' immersion* and *while still immersed* in water.

The italics are the writer's. It would appear from the above that the tests are unnecessarily severe, and seem to bear little relation to the actual conditions under which the material is to be used.

If anyone suggested esting iron or steel for breaking stress at a very high temperature, say, or with alternating forces, when it was to be used under quite different conditions, the proposal would be immediately rejected.

Since pure water is practically an insulator, water by itself cannot be a very objectionable substance. It is not difficult to imagine that, perhaps, more damage might be done to a cable by prolonged subjection to vapour of water with the usual atmospheric impurities.

Probably testing cables by total immersion in water is a legacy left us by telegraph engineers, where, of course, one sees the necessity of testing a cable immersed in "salt" water. It seems to the writer, however, more difficult to understand the necessity for such a test being applied to cables and wires which are manifestly going to be used in comparatively dry places, such as dwelling houses, &c.

When one considers that in ordinary installation work the actual insulation of the wires themselves is of very little effect in raising the insulation of the installation as a whole, one cannot avoid the conclusion that a great deal too much stress is laid upon the wires and their insulation and testing.

The insulation of a building seems to depend more on the insulation of ceiling roses, lampholders, &c., than upon anything else.

Let J = leakage resistance per light.
n = number of lights.
I = insulation resistance per mile of wire.
k = miles of wire per light.

Then if we assume that the wire used is in direct proportion to the number of lights, we obtain, expanding the usual expression for the joint resistance by the binomial theorem—

$$R = \frac{J}{n}\left(1 - \frac{k\,J}{I}\right) \text{ approximately.}$$

Now J is usually of the order 30 or 40 megohms for a dry building, to 3 megohms for a damp one. Also the value of $\frac{k\,J}{I}$ is negligibly small in most cases. For instance, if $\frac{1}{10}$ mile of wire is used per light, J = 30 megohms, and I is 2,000 megohms per mile, the value of this term is $\frac{30}{1\,8\,0\,0\,0\,0}$.

One frequently hears great stress being laid upon the necessity for highly insulated wires in damp places, whereas we see it is just in such places that the insulation of the wires themselves has a negligible effect.

Further, since the metallic-filament lamp is now being largely used, it would appear that supply companies will require to tap the poorer districts. Until a cheaper system of wiring is produced this can hardly be done at present. On the Continent one sees flexible very largely used indeed, and one might suggest that the same might be done here.

A building which came under the writer's notice had some 650 lights, mostly pendants, many of them very long. After some 11 years several of these pendants short-circuited at the lampholder, the pendants where this occurred being mostly in draughty places, where the swaying caused the cord to wear through. There does not appear to be the least reason why flexible should not be used much more freely in this country.

At the present time we notice the strange anomaly which has gradually been growing up, viz., highly insulated wires drawn more or less carefully into iron tubes, the tubes themselves requiring to be carefully earthed. The system is the worst that anyone can possibly conceive from the point of view of (*a*) cheapness, (*b*) danger from shock and damp, and (*c*) ungetatability. Here we see a system in which electricity, instead of being much easier to install than gas, is actually many times more difficult in labour alone.

It seems from considerations such as the above that something might be done to improve wiring and wiring systems generally. So far too much attention has been paid to mere insulation of cables and wires, whereas, in the writer's opinion, scientific design of ceiling roses, &c., to prevent leakage, especially in damp places and in large buildings, is much more important.

At present it will be noticed that in the case of both lampholders and ceiling roses, it is impossible to obtain anything like a high insulation if there is the least dampness about.

CORRESPONDENCE.

Letters received by us after 5 P.M. on Tuesday cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.

Electricity in Mines.

"Mines Electrical Engineer," in my opinion, goes away from the subject on which Mr. Sydney F. Walker writes, and only bears upon the danger of explosions by firing gas through using electricity.

The fatalities caused by explosions through firing gas with faulty electrical work or materials, are only a small percentage of the electrical fatalities that *do* occur, although I realise the fact that explosions may have more serious results.

Would "Mines Electrical Engineer" credit a plant being in charge of a so-called competent electrician, and yet this man could not even insulate a joint properly, or repair a telephone? It is all very well to say that a manager should be quick to find out if a man is competent, but to do this he must be a competent electrician himself.

Suppose he advertises for an electrician, and a man applies who has only been a wireman, and has had no shop experience or colliery experience, but has good testimonials. Or, again, suppose a man who has been in charge of bell signals, telephones, and a few lights on a pit surface, applies for a job at another pit where there is a power plant, and his old manager gives him a good reference, can you blame a manager for thinking in both cases that the applicant is a competent man?

In the case of a new plant being installed it might, perhaps, be a year or two before any repairs were necessary to test the capabilities of an electrician; but if, as suggested in Mr. Williams's letter in your issue of the 12th, every colliery electrician had to hold a certificate of competency, there would be no doubt on the matter; and if a society was formed, then electrical manufacturers would be able to ascertain the underground requirements from the discussions and papers given from time to time by experienced colliery electricians, which I may suggest would be published in this paper, and in the *Colliery Guardian* for the benefit of colliery managers.

Of course, it is obvious that if an electrician in charge had as many medals as Colman's mustard that would not prevent accidents; but, at the same time, a competent man who thoroughly realised his responsibilities could do much in many instances to prevent fatalities from happening or being likely to happen.

A ship's captain has not to find out for himself if his engineers are competent men. He is satisfied on this point by the fact that they hold B. of T. certificates. Why should not a colliery manager be in the same position?

Another point that "Mines Electrical Engineer" overlooks is the fact that where one electrician may be a conscientious man as regards his duties, there will be a dozen who are not so, and whose sole object is to put in time and do as little as possible, especially if they are paid by the shift.

Another point—what about plants that have been working some time and which would not bear expert inspection, and which have even been passed and accepted by insurance companies?

I do not wish to pose as an authority on electrical matters, but I do certainly think that several of the rules and regulations of the Coal Mines Acts relating to electricity require to be made more stringent, and in some cases new rules added.

As for the writer who objects to giving elementary teaching on electricity to miners, &c., I think he would soon change his opinion if he were called out of his bed at 3 o'clock on a winter's morning to go out in two feet of snow and then travel two miles underground to replace a fuse or repair a bell signal wire.

I should like to read Mr. Nelson's, Electrical Inspector of Mines, opinion of the recent letters on this subject.

Colliery Electrician.

An Overcrowded Profession.

I was interested in the letter by "Ohm Sick" in the current issue of the Review. It is a pity he has spent such an exceptional amount on his training, but his experience is only another argument for an association of assistant engineers.

It is some consolation to know that the correspondence about this time last year was not fruitless, and that the movement is under way, though rather slow; I wish the men who sent in their names could have been formed into a provisional society, so that we could have commenced building up a mutual assistance fund at once.

However, to return to the above letter. We have another beautiful example in the current issue, this time from our friend, the marine engineers' champion at Ipswich, who was loud in his praises of marine men some time back, but it is now interesting to know that he does not think a marine engineer with a first-class Board of Trade certificate is worth more than 35s. per week. Comment is needless. There is no doubt that more harm is done to the profession by a certain class of our own members (and some of them are on the roll of the Institution of Electrical Engineers) than by all the directors and committee men in the kingdom.

I think it would be a great help if assistants would exchange more confidential information with each other. I know men engaged in station work in the north of England, Scotland and Ireland, and I should be pleased to answer any assistants' inquiries in strict confidence, should they be going in for positions in any of the above-mentioned districts. I may be the means of saving men from getting into one or two undesirable places I know of.

I do not think the editors would mind forwarding letters to me, if they are enclosed in stamped blank envelopes.

Electricity Supply.

February 20th, 1909.

Malta.

In the last issue of the Electrical Review I read a paragraph under the heading of "Malta," and signed "Disgusted," and would like to reply as follows.

"Disgusted" has expressed his views concerning Malta and its inhabitants in a manner which makes it quite evident that his experience has been not only very limited, but most unfortunate.

The average individual will make allowances for, and expect to meet with, certain characteristics in Eastern races, and have sufficient common sense to know that these characteristics will not affect the welfare of the ordinary Englishman.

If, as "Disgusted" states, large numbers of persons go to Malta to serve under Government, then social conditions must be improved, and the warning given should be taken as highly prejudiced, especially as the island is still described as having a delightful climate, and is the winter resort of many Englishmen.

Ha Curmi.

Fibre as an Insulator.

The experience of your correspondent "Puzzled" as particularised in your last issue regarding the use of a fibre insulation is interesting, but easily explained. In the first place, flexible fibre should never be used for electrical work of any kind—only hard; and I, personally, prefer the hard grey vulcanised fibre of —— manufacture, as being the hardest and best grade of fibre on the market. Let "Puzzled" try the hard grey vulcanised fibre in question under the same conditions and et us know the results.

J. Giltoore.

London, S.W., *February 16th*, 1909.

The Need of Co-operation in the Electrical Industry.

I am obliged to you for copy of pamphlet on "The Need of Co-operation in the Electrical Industry," and in reply to your request that I should give you my views, I may do so as follows:—

The primary suggestion in the pamphlet is that the industry is suffering from legislative repression, and that a strong association is needed to exert pressure on Parliament; there are subsidiary questions mentioned, but this is put in the forefront. I do not believe that the root of the trouble in the electrical industry arises from this source, and hence, whilst I am strongly in favour of all organisation of industry, I do not think an association which looks to Parliament to help it will achieve much, or is much wanted. I do not overlook the hurried and ill-conceived legislation which affected the early history of the industry, but that is now a thing of the past.

In my view the trouble lies in economic causes. English manufacturers and English financiers have all along devoted their energies too much to competition in lighting with gas, and in power with steam, where the saving over existing methods is small, whilst the German manufacturers and financiers, who are the only ones who have been really financially successful, have worked both at home and abroad where gas and power were more expensive, and where electrical methods had larger margins. Coupled with this, or arising from it, a productive power of the manufacturers vastly in excess of the requirements has been created, with the result that an insane competition has arisen among manufacturers, urged on by their salaried staffs, whose interest in the dividend question is practically nil.

What is wanted appears to me to be that each section of the industry should first organise itself, and refuse to do work at prices which yield no profit; these sectionalised organisations can always, when necessary, co-operate in larger questions, and could further, when they had convinced financial men that they were conducting business on business lines, obtain financial co-operation in any large scheme for parts of the world where the economic conditions were such as to make electrical enterprise a sound investment. But these are commercial questions which do not require any organisation outside the businesses, or groups of businesses, specifically interested.

With the *political* discussion of fiscal questions now so prominently before us, an association which pins its hope on legislation must inevitably be drawn into this, and the divergence of view between various sections of the industry, and even between individuals in the same section, would render co-operation impossible.

The idea that the interests of consulting engineers and manufacturers, of buyers and sellers, of municipal and private promoters, can all be reconciled in one association, appears to me to be a dream. I have inquired from some of those whose names appear in the list of "members of provisional committee" as to what concrete action they have formulated to themselves as possible for such an association,

and the replies are generally to the effect that they have agreed to assist because "something wants doing," but I have failed to find that any well thought out idea exists as to what is the source of the trouble with the electrical industry, or the means of improving its condition.

Llewellyn B. Atkinson, M.I.E.E., A.M.I.C.E.

AMERICAN TELEGRAPH STATISTICS.

The following is the preliminary report on Telegraphs, issued by the Department of Commerce and Labour, Bureau of the Census:—

CONTINENTAL UNITED STATES

(Exclusive of Alaska, Hawaii, Philippine Islands, and Porto Rico).

The statistics relate to the years ending December 31st, 1907 and 1902. The totals include reports of commercial land telegraph companies owned and operated within the United States, and of domestic ocean cable companies operating from the United States, but do not include telegraph lines operated by railway companies.

	1907.	1902.	% inc.
Number of systems or companies	25	25	..
Miles of single wire (exclusive of ocean cable)	1,577,961	1,318,350	19·7
Nautical miles of ocean cable	46,301	16,677	177·7
Messages, total number	103,794,076	91,655,287	13·2
Total income	$51,583,868	$40,930,038	26·0
Total expenses (including taxes, interest, and fixed charges)	$41,879,613	$30,948,034	35·3
Total cost of construction and equipment (including real estate)	$210,045,959	$161,679,379	29·9
Capitalisation:—			
Capital stock authorised, par value	$161,603,900	$123,233,075	31·1
Capital stock outstanding, par value	$155,089,575	$117,053,525	32·5
Dividends on stock	$7,477,083	$6,256,693	19·5
Bonds authorised, par value	$83,004,000	$49,893,000	66·4
Bonds outstanding, par value	$65,504,000	$45,893,000	42·1
Interest on bonds	$2,651,511	$1,949,150	36·0
Total par value stock and bonds outstanding	$220,293,575	$162,946,525	35·2
Employés and wages:—			
Average number	28,034	27,627	1·5
Total salaries and wages	$17,808,249	$15,039,673	18·4

The final report for 1907 will contain an analysis of the above totals and present detail statistics for other phases of the industry.

THE EFFECT OF BRUSH POSITION ON THE NO-LOAD LOSSES IN D.C. MACHINES.

The method of determining the efficiency of direct-current machines from the c^2r losses, and the measured watts required to drive the machines unloaded, as motors, is sometimes indefinite because of the marked effect of the position of the brushes on the no-load losses. When making this no-load test on some machines, shifting the brushes slightly from the true neutral position, without producing any noticeable sparking, will increase these losses as much as 50 or 100 per cent. With a view to deciding which brush position enables the closest approach to the true efficiency to be obtained in the subsequent calculation, Herr W. Linke recently carried out some tests on the point in the A.E.G. testroom.

The machine tested was a 10-H.P. 440-volt 19-amp. 1,150 R.P.M. motor, which showed a marked change in the no-load losses with the brush position. With the brushes in the correct "motor position" (16 segments or 9 electrical degrees back), the machine ran perfectly sparklessly at full load, and showed very little sparking at no-load, and the current taken to drive it was 2·4 amps. at 440 volts (= 1,100 watts). When the brushes were shifted forward into the true neutral position, the driving current fell to 1·3 amp. at 440 volts (= 580 watts). The difference in watts (about 500) is some 6 per cent. of the full load of the machine, and is therefore by no means negligible. The difference in the losses is evidently due to c^2r losses in the short circuit under the brush, and this view is confirmed by the results of the following three temperature tests made on the motor. Each test lasted six hours, so as to allow the steady temperature to be reached. The first test was as a motor at normal full load and speed with the brushes in the "motor position"; the armature-winding resistance increased 13 per cent., giving a temperature rise of 32·5° C.; the iron-core temperature rise by thermometer was 32° C. In the second test the machine was driven from outside, unloaded, with its brushes disconnected from the supply, and was separately excited for 440 volts; the brushes were in the neutral position. The armature resistance now only increased 7 per cent., giving a temperature rise of 17·5° C., and the core temperature rise by thermometer was 18° C. The third test was a repetition of the second, but with the brushes shifted into the "motor position." The resistance increase was now 16 per cent., corresponding to a temperature rise of 40° C.; the core temperature by thermometer was 31° C.

The full-load copper losses in the armature were 300 watts (armature resistance = ·82 ohm), whilst the difference between the two no-load losses was some 500 watts, so that the higher temperature attained in the third test as compared with the first test is readily explained.

The motor was next directly tested for efficiency by coupling it direct to a 10-KW. commutating-pole generator, whose efficiency was known from its measured resistances and no-load losses. A preliminary test showed that the no-load losses in this generator were quite unaffected by brush-shifting, at any rate, between 4° backward and 12° forward lead.

In fig. 1, curve *a* shows the efficiency of the 10-H.P. motor calculated on the assumption of the lower no-load losses (brushes neutral), whilst curve *b* is calculated assuming the higher no-load

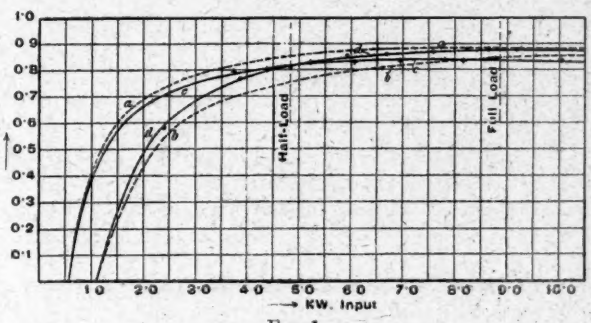

FIG. 1.

losses (brushes in motor position). Curve *c* gives the actually measured efficiency when the motor brushes were neutral, and curve *d* the measured efficiency when the brushes were in the correct "motor position." In all cases any "additional iron losses" due to armature distortion, &c., in either the motor or the generator, have been neglected.

It will be seen that at small loads the motor efficiency was far better with the brushes neutral than with the backward position, whilst at higher loads the reverse was the case. There is, in fact, one best position of the brushes at each load, even though, as in this case, no appreciable sparking could be noticed in either brush position at any load between no load and full load. The true full-load efficiency actually measured with the brushes in the correct motor position (curve *d*) is about 1 per cent. lower than the full-load efficiency estimated from the no-load losses in the neutral position (curve *a*, fig. 1), this slight difference being probably due to the extra losses due to armature distortion. In any case the lower no-load losses enable the true efficiency to be much more closely estimated than do the higher no-load losses.

Herr Linke has confirmed his results by some interesting oscillograms taken on the 10-H.P. motor. The armature winding (series) was opened at one point and closed again by a standard resistance through two collector rings. The standard resistance

FIG. 2.

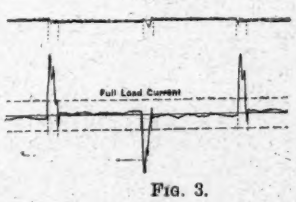

FIG. 3.

FIG. 4.

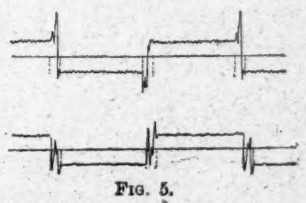

FIG. 5.

was connected to the oscillograph, which, therefore, indicated the variations of the current in the armature winding. For the purpose of taking up the curve of flux round the armature, an auxiliary coil was placed in the armature slots, having the same span as the armature coils, and was connected through two more collecting rings to the oscillograph.

Fig. 2 shows the current in one branch of the armature winding when the machine was running light as a motor (brushes neutral).

Fig. 3 shows the armature current when it was running light as a motor (brushes in "motor position"). The large short-circuit currents as compared with fig. 2 are well brought out by these curves.

Fig. 4 shows the armature current at full load as a motor, with the brushes neutral; and fig. 5 shows the corresponding values for the case when the brushes are in the "motor position." Differences in the no-load losses with the brush position, of the same nature as those described above, are found to occur in most machines up to 50 KW., and even in large machines variations of 20 or 30 per cent. frequently occur. In machines fitted with properly adjusted commutating poles no such differences are observed, at least so long as the brushes are within the range of the commutating pole; and this may lead to a marked improvement in the net efficiency of a motor working with fixed brushes on a constantly varying load.—*E.T.Z.*

D

REVIEWS.

Modern Power Gas Producer Practice. By Horace Allen. Manchester: The Technical Publishing Co. 1908. Price 6s. net.

This book brings together within portable and readable form the art of gas production for power purposes as distinguished from that of gas produced by simple distillation. The difference is sharply defined. An ordinary distillation gas is produced by heating a fuel in a closed vessel. Such a gas is, therefore, theoretically almost wholly combustible, and all its combustible parts are hydrogen or hydro-carbons. If there is carbon monoxide present, this is accidental or casual only. Producer gas, on the other hand, is a product of arrested combustion. Fuel is burned by admitting air to it. The heat thus generated heats a superincumbent mass of fuel to incandescence, and the carbon dioxide of the first complete combustion combines with the hot carbon and is reduced to carbon monoxide. Producer gas depends, in fact, chiefly on the fact that carbon burns to two oxides, and the first one gives out less than half the heat of the second oxidation, on which the onus of vaporising the carbon has not fallen. The surplus heat of the incandescence serves to decompose steam, so that a producer gas consists of a mixture of carbon monoxide, hydrogen and nitrogen more or less diluted with oxygen and carbon dioxide. Its composition in these items varies with the amount of steam employed. It is, then, of these various producer gases that this book deals, including blast-furnace gas, which is, of course, of the producer gas order, for the blast furnace is much more efficient as a gas producer than as an iron smelter, owing to the unavoidable circumstances of its design.

Producer gas is growing daily in importance—has done so ever since 1894, when Thwaite pointed out what could be done with blast-furnace gas. This pioneer teaching has brought about the big gas engine, and the big gas engine, in turn, has shown the way to better gas production, so that to-day gas producers are fairly perfect when used with anthracite or coke fuel. It was but a step from the blown producer to the suction producer, which has done much for the user of small powers.

The author makes reference to the natural gas found at Heathfield, in Sussex, when boring an artesian well for the railway company. But it should be stated, perhaps, a little more distinctly that this gas must not be confused with the American natural gases from the salt-bearing rocks. Nor is there much prospect for the Sussex gas. The engineer under whom this boring was undertaken states, as his opinion, that the gas did but rise from a hole pierced in a sort of inverted basin, and that the area was probably too limited on which to base much future expectation.

The author deals in turn with natural gas, blast furnace gas, and coke oven gas—which is hardly a producer gas proper, but rather a crude retort gas. He then deals with the chemistry of gas production. On page 22 we note a misprint of + for × in line 10.

Chapter IV deals with specific heat, and Chapter V with gaseous volumetry. Coal is treated of in the sixth chapter.

In Chapter VII the gasification of fuel is discussed, the effect of steam being explained. Then follows a chapter on producers, their product, its analysis, the varieties of producers, and bituminous producers, none of which have so far been great successes. Poking holes are advised for all producers. These enable the fuel to be broken down should it hang up to the walls or arch over. It is the freedom from such troubles and its certain gravitation that makes anthracite so excellent a fuel in a producer. The efficiency of a producer, as shown by its production of CO_2—which should be a minimum—is considered. The author also points out that whereas a steam boiler requires manual skill in stoking, there is no skill required in coaling a gas producer. Numerous analyses are given, and a section deals with gas transmission through pipes.

Next follow descriptive accounts of various producers, and Chapter X deals with the suction producer, several plants being illustrated and described; the trials of the Agricultural Society in 1905 and 1906 are drawn upon in Chapter XI, and a list is given of nearly thirty electrical stations driven by gas in this country. Reference is made to the failure of the Johannesburg gas power plant, but so little is known of the causes of this, that one can only conclude that the plant was not well designed, for no such failure has, we believe, occurred within the same period in other large power installations. True, there was trouble at Lackawanna, but did they not there attempt to use uncleaned gas? The use of uncleaned gas was a Belgian fad, against which English engineers always protested, and it certainly brought its own reward.

A chapter is given on blast-furnace gas, and the necessity of final filtration after washing is shown by the fact that in the case of some German furnaces washed gas still held a couple or three ounces of dust per 1,000 cb. ft., that is, per about 10 or 12 H.P.-hours.

Though water-sprayed fans are very efficient as cleaners of gas, they do not seem able altogether to render unnecessary a final sawdust filter, for nothing seems better than this material for arresting the last dust.

Next follows a chapter on the action of gases in the engine, full of useful facts; a chapter on proportions of pipes, chapters on analysis, on calorimetry, on dangers in manufacture, on testing producers, a long list of recently completed patents connected with the subject, and, finally, an Appendix concerning recent developments in producers.

The book is thus a very full treatise on its subject, and it is written by an author who has had years of practical work with blast-furnace gas and other gases. Every power engineer should possess the book. It is well worth many times its moderate price.

Electro-Metallurgy. By John B. C. Kershaw. London: Archibald Constable & Co. Price 6s. net.

The position of electro-metallurgy to-day is such that no text-book on the subject can have any permanent value except as a summary of this new branch of industry, up to the time of publication. In almost every direction new ideas are causing a revolution in the various branches of this modern development, and few, if any, have gained a stable condition. With such a state of rapid progress the difficulties in the way of authorship are obvious. Thus, although the present book deals with the condition of electro-metallurgy in 1906, it cannot be regarded in 1908 as an up-to-date work. This state of affairs is perfectly well known to the author, and allowance must be made for the change that has taken place.

The book attempts to bring the intricacies of applied electricity within the grasp of the average man, and, as is explained in the preface, without attempting to discuss the theoretical side of the subject. To further this idea a glossary explaining technical terms has been added. With such an object in view the book is bound to miss its mark. In the first place, the glossary is totally inadequate, and in the second it is impossible to write a technical treatise without the aid of technical terms and still retain the full value of the work. In fact, the author himself has by no means adhered to his task. Both technical terms and chemical equations have been introduced into the text, and these certainly add value to the book. Altogether there are 300 pages of text, divided up into 16 chapters. The first chapter is introductory, and deals with the historical development of the electro-metallurgical industry, while the remainder gives the position, process and cost of working of all the important processes up to 1906. This is followed by a glossary and a name index. A subject index is omitted as unnecessary, the headings of the chapters being deemed sufficiently explanatory.

The book is well written, and for the most part the information is accurate. A few errors have crept into the book which render some parts rather confusing. On page 24, lines 25 and 27, "alumina" is written when "aluminium" is probably meant. Again, on page 78, line 19, 14s. is rather a low price for a ton of calcium carbide, and £14 would be nearer the truth. At the top of page 229 there is also a printer's error. The description of the Ballach process of refining bullion on page 56 is both confusing and inaccurate. In the exact words of the author, the following statement is made:—"The electrical connection is obtained by the silver contact piece marked B —, which rests on the anode slabs of Acheson graphite (*c c c*) ½ in. thick, fitted to

the bottom of the tank. The silver contact piece D provides the electrical connection with the negative pole of the dynamo." On referring to the diagram provided for the elucidation of the above statement, it will be found that the contact piece D and not B fits on the slabs of Acheson graphite (*c c c*), and apparently B fits on to no lettered slabs at all. These are small blemishes, and do not by any means destroy the value of the work. The task of compiling such a record as this present one is enormous. Difficulties are met on every hand, and not the least of these is the profound silence maintained by electro-metallurgical manufacturers. In many cases the reader will have to content himself with a very meagre outline of what is probably a successful industry. For the most part the processes dealt with are obviously intimately known to the author, and only in a few cases are essential details omitted when the latter are public property. In the description of the fixation of nitrogen from the air by the cyanamide process a serious omission is noticeable. Calcium carbide certainly does unite directly with nitrogen, but for successful working a catalytic agent such as calcium chloride is required, a fact not mentioned in the text. From end to end this book holds the attention of the reader, and does not suffer from the modern failing of verbosity. Those who have not followed the development of modern metallurgy, and wish to add to their knowledge, cannot do better than study this volume. In fact, all students of technical science owe thanks to the author for this very interesting work.

LEGAL.

INLAND REVENUE DEPARTMENT *v.* ANGLO-ARGENTINE TRAMWAY CO.

LAST week in the King's Bench Division, before Mr. Justice Channell, this action was brought by the Inland Revenue Department for whom the Solicitor-General appeared to recover stamp duty on the balance of capital authorised but not raised. The Anglo-Argentine Tramway Co. desired, for the purposes of their own undertaking and to enable them to aquire other undertakings, to increase their capital, and a general meeting of the shareholders by resolution authorised an addition of £5,000,000, but of this only £3,000,000 had been issued. Under the Stamp Act, 1891, Sec. 112, the Crown claimed to be entitled to charge the stamp duty of 5s. on each £100 of the total authorised, and not upon the amount issued only. The company had paid the duty on the £3,000,000, leaving the £2,000,000 unissued upon which £5,000 was claimed as stamp duty. The Solicitor-General contended that the authority having been given by shareholders' resolution, the directors had power to raise the whole of the £5,000,000 when occasion required, and were therefore liable for the stamp duty on the whole.

SIR ROBERT FINLAY, K.C., who appeared for the defendant company, contended that an authorisation by the shareholders without the actual issue, was not sufficient to attract the duty, but that there must be an actual issue before the charge could be made—an actual increase of the registered capital.

His LORDSHIP, in giving judgment, said that the duty was evidently charged to prevent companies from placing themselves in a fictitious position by taking authority for an amount of capital which they did not want nor could ever hope to get. It was the maximum limit for which power was sought by a company which the Legislature intended to tax, and he, therefore, interpreted the term "registered capital" as meaning "authorised capital" in the sense of the maximum amount they were entitled to ask for. He, therefore, gave judgment for the Crown for the amount of the whole duty, what had already been paid to be deducted. Judgment was given accordingly.

SIR ROBERT FINLAY applied for and obtained a stay of execution, which drew from the SOLICITOR-GENERAL the observation that the sooner the money came to the Exchequer the better they would be pleased.

Early Experiments in Electric Traction.—It is not generally known that the very first practical demonstration of electric railway traction took place in Glasgow. Acting on a suggestion of Mr. W. M. Mordey's, Mr. W. W. Lackie recently instituted inquiries into the matter, and has presented a note on the subject to the Local Section of the I.E.E. It appears from his investigations that Mr. Robt. Davidson, of Aberdeen, constructed an electromagnetic carriage, which in 1842 was tried on the Edinburgh and Glasgow Railway, and ran at a speed of 4 miles an hour. The carriage was propelled by eight electro-magnets, fed by a primary battery of 40 cells, the weight of the loaded vehicle being about 6 tons.

BUSINESS NOTES.

The Dissolution of the German Cable Syndicate.—The constituents of the German Cable Syndicate, the dissolution of which was recently announced in this journal, were the Allgemeine Elektricitäts Gesellschaft, the Siemens-Schuckert Works, Felten & Guilleaume-Lahmeyer Works, the Duisburg Cable Works, Rheydt Cable Works, Deutsche Kabelwerke (Hirschmann) of Rummelsburg, Dr. Cassierer & Co., of Charlottenburg, the South German Cable Works, of Mannheim, the Land and Sea Cable Works, of Cologne-Nippes, and the Meissen Wire and Cable Works. It is stated that the operations of the syndicate were limited to the inland market, and that the collapse was brought about by the action of the Bergmann Electricity Works Co. The latter recently started a new cable factory, and by quoting low prices secured large orders from communal and company-owned electricity works. It appears that the prices offered by the syndicate in connection with these contracts would have yielded large profits to the cable makers, and the prices were consequently of advantage to the Bergmann Co. on the one hand, whilst, on the other, the latter company counts upon avoiding certain intermediate costs by having directly connected its cable factory with its Rosenthal metal works as now enlarged. The syndicate and the company entered into negotiations for the latter's inclusion, but the difference between the Bergmann Co.'s demands and the concessions which were offered by the large firms was so great, that the scheme failed to mature and the syndicate was dissolved at the beginning of February. A severe contest is now proceeding for the possession of orders, and prices have fallen by 20 per cent.

Patent Application.—MESSRS. G. MITCHELL and L. D. COPELAND have applied for the restoration of patent No. 20,225/1902 for "An Improved Process and Apparatus for Utilising the Heat of Hot Slag for Generating Steam," which expired in 1907 owing to non-payment of renewal fee.

Condensing Plant Contracts.—The following is a list of contracts that have recently been received by the MIRRLEES WATSON CO., LTD.:—

Bolckow, Vaughan & Co., Ltd., Dean and Chapter Colliery, Durham.—Elevated jet plant.
Powell Duffryn Steam Coal Co., Aberaman.—Elevated jet plant.
Lothian Coal Co., Ltd., Midlothian.—Surface plant.
Carrongrove Paper Works, Ltd., Denny, N.B.—Low level jet plant.
Bolsover Colliery Co., Cresswell Colliery (per B.T.-H. Co.).—Low level jet plant.

East Fife.—The Cyanide Works at Kirkland, near Leven, are to be converted into a foundry for the manufacture of steel castings for automobile engines and electric motors. The promoters expect shortly to issue a prospectus, but it is understood that the bulk of the capital of £50,000 will be subscribed privately. Amongst the promoters are Mr. John Cowan, managing director of Messrs. Redpath, Brown & Co., Edinburgh.

Social.—A social evening was given by the directors of MESSRS. RAWLINGS BROS., LTD., of Kensington and Belgravia, on Saturday evening last at Slater's Restaurant, 13, Brompton Road. Nearly 300 of the employés and their wives, sisters and sweethearts were present. Musical items formed a large part of the evening's programme, many of them being contributed by the employés themselves. During the evening the chairman, Mr. W. R. Rawlings, announced that the sale of the programmes in aid of the Rawlings Benevolent Fund had realised the sum of £5 5s., and that one of the objects of the gathering had been thus achieved.

"Sunbeams."—The staff and employés of the SUNBEAM LAMP CO., LTD., held a whist drive and dance on 18th inst. As well as being an event for relaxation, the gathering was intended to signalise the completion of the company's new works for the manufacture on an extensive scale of the Sunbeam "metal" lamps. The Beaconsfield Hall was brilliantly illuminated by lamps of the company's latest type, and the evening was a great success. There were present Mr. T. J. Grainger, secretary and assistant manager, Mr. H. W. Edmundson, assistant manager, and Mr. J. Gledson, manager of the Newcastle depôt. A Committee, representing the various departments of the works, arranged the details of the function, and among those who contributed to the musical portion of the programme was Mr. H. W. Edmundson. The prizes for the whist drive were the gift of the secretary, and were gracefully presented by Mrs. T. J. Grainger. During the interval a few remarks were made by the secretary, who spoke in an optimistic strain of the company's prospects. He stated that their productions from the present works had been large and very satisfactory, expressions of cordial appreciation being continually received. The large premises just finished would give greater facilities to deal with the manufacture of the new lamps, thus ensuring prompt deliveries, a matter of the utmost importance to the buyer, and one which, owing to the abnormal demand, had presented some difficulty during the present season. The present works would continue to be utilised for the manufacture of the carbon lamps, which are still in great demand, in spite of the metal-filament lamp competition.

The D.P. Battery Co., Ltd.—To cope with their annually increasing output of storage batteries, this company have reorganised and extended their works at Bakewell, already covering some 5 acres, but reserving 10 acres for future requirements. The additional large forming shop recently completed affords facilities for increasing their output by some quarter million of plates annually, which, with a stock of over 20,000 plates of standard

types, will enable the company to give prompt delivery. A special feature in the works is the test room and laboratory in which a careful supervision is exercised over the products in the various states of manufacture and in the analysis of all metal used. We understand that both in the Home and Foreign Trade the firm's output formed a record in the year 1908, and judging from the increasing number of inquiries, the general depression in trade is not seriously affecting the demand in this industry.

Trade Announcements.—In the Geographical Section of the "Universal Electrical Directory (J. A. Berly's)" for the current year, the British Electric Calibrated Fuse Co., appears as a limited company. This is incorrect, as the limited company was wound up some years ago; perhaps, in order to avoid misunderstanding, users of the book will strike out the letters "Ltd." on page 790, under "Harpenden."

THE PULSOMETER ENGINEERING CO., LTD., announce that they have acquired the business of Messrs. Easton & Anderson, Westminster (successors to Easton & Co., of Erith), including their goodwill, designs, records, and patterns, also the services of the heads of the designing and commercial staff. They will, therefore, be able to carry on the new work satisfactorily without disturbing their existing business.

THE CAMBRIDGE SCIENTIFIC INSTRUMENT CO., LTD., announce that from January 1st they have taken over the sole rights of sale and manufacture, outside the American Continent and Germany, of the thermometers, gauges, &c., of the Hohmann and Maurer Manufacturing Co., of London and Rochester, N.Y., U.S.A., and the regulators of the H. and M. Automatic Regulator Co., of Rochester. Mr. Coppard, who represented the Hohmann and Maurer Co. in the past, has entered their service. All communications with reference to the above goods which were formerly sent to 98, Clerkenwell Road, London, E.C., should now be sent to the Cambridge Scientific Instrument Co., Ltd., at Chesterton Road, Cambridge.

THE PIGGOTT ELECTRICAL CO., of 24, New Bridge Street, London, E.C., have just been appointed sole London agents for Messrs. Smith Bros.' specialities of cables, flame arc lamps, enclosed arc lamps, arc lamp carbons, incandescent lamps and electrical accessories, which also includes carrying a large London stock. They will continue to act for the other firms for whom they are agents.

Mr. FRED. HARGREAVES has taken over the business of the Electrical Maintenance Co., 87, Piccadilly, Manchester.

We learn that owing to continued extension of business, the ARMORDUCT MANUFACTURING CO., LTD., have taken up additional accommodation in their present building in Farringdon Avenue, E.C., which they are now practically occupying in its entirety.

MESSRS. JOHN H. HARPIN & Co., of Birmingham, have just opened a branch office at 19, Priory Street, Dudley, in order to deal with electric lighting and electrical power work in that district; they invite manufacturers to forward lists.

MR. J. M. VAUGHAN, electrical engineer and contractor, has removed to 9, Triangle South, Bristol.

Catalogues and Lists.—THE DIESEL ENGINE CO., LTD., 179, Queen Victoria Street, E.C.—Blotting slips with a celluloid cover showing two Diesel engines of 300 B.H.P. each, coupled to alternators running in parallel, and pointing out that the engines are made for stationary and marine work in sizes from 20 to 1,500 B.H.P., also that over 300,000 B.H.P. have been sold.

HART MANUFACTURING CO., 72, Victoria Street, S.W.—Small leaflet relating to their new "Diamond H" push-button motor-car switch, which is a reduced replica of the well-known switch of this type used for house lighting installations. The new switch is specially designed for controlling the lighting circuits in motor-cars; it is sunk flush with the interior of the car. The contacts are of phosphor-bronze, and the insulation is of India sheet mica. The switch is indicating, and it may be seen at a glance whether a light is on or off by the position of the buttons. The switches are made up in gangs, two or more being placed side by side under one plate to control different lights.

MESSRS. B. PAEGE & Co., 52, Chapel Street, Blackfriars.—List giving particulars of their acid-proof varnishes and paints.

MESSRS. SIEMENS BROS. & Co., LTD., Queen Anne's Chambers, Broadway, Westminster.—February supplement to catalogue No. 37, giving description, dimensions, weights and prices of a new cell, the "Dura" patent, which they are placing on the market.

MESSRS. MIRRLEES, BICKERTON & DAY, Hazel Grove, near Stockport.—Twenty-page illustrated pamphlet in which they give a brief description of the Mirrlees-Diesel oil engine, with notes *re* cost of running, and notes drawing attention to its special features. A list is also given of some of His Majesty's ships whereon these engines are at work driving dynamos. There are at the beginning of the book some interesting notes regarding the company and its engine, and the development of both. Engineers generally will find this book worthy of perusal.

MESSRS. TETLEY & Co., Falcon Electrical Works, Bedford Street, Greengate, Salford.—Price list No. 20, giving illustrated particulars and prices of "No-Flash" cartridge fuses (Mordey type) and fuse wires.

MESSRS. W. T. HENLEY'S TELEGRAPH WORKS CO., LTD., Blomfield Street, London Wall, E.C.—List No. U104, which is a second edition of their catalogue of dividing boxes, to which they have added a section dealing with H.T. boxes for working pressures up to 11,000 volts. All the boxes listed are kept in stock. A special features of these boxes, as is the case with all Henley's standard boxes, is the arrangement enabling the joint to be made before placing the box in position. The list contains a description of the firm's patented arrangement for bonding the lead sheathing of the cable to the boxes.

MR. G. BRAULIK, 8, Lambeth Hill, E.C.—Supplementary catalogue (36 pages) of electric fittings, containing illustrations, with a note of prices, of a number of new designs, which, among others, may be seen at his showroom as above. The fittings in the list include pendants, hall lanterns, brackets, counterweight and electrolier fittings, standards and shades.

THE ROTARY SCREWING DIE SYNDICATE, LTD., 4, Greenland Place, Camden Town, N.W.—Eight-page pamphlet, giving a description with illustrations, of Moy & Bastie's rotary screwing die for manufacturing screw threads by the rolling or pressing process.

THE MIDLAND ELECTRIC MANUFACTURING CO., LTD., Stafford Works, Conybere Street, Birmingham.—Leaflets S1 and S2, illustrating and pricing their Stafford multi-blade knife switches and "D" type main switches.

MESSRS. NEWTONS, LTD., Taunton.—New catalogue, in which is given full specification information, also tabulated speeds, outputs, sizes, prices, &c., of the "Zone" type dynamos and motors. A good deal of useful matter as to methods of construction, also hints on management of machines, numerous dimensioned drawings, shipping particulars, &c., are published, which would be of interest to the electrical trade, to any member of which the firm will send a copy on receipt of a postcard.

MESSRS. VICKERS, SONS & MAXIM, LTD., River Don Works, Sheffield.—New edition (third) of their pamphlet describing the Vickers' patent system for electrically driving planing machines, in which the variable speed motor reverses itself, and is controlled by the firm's patent switchgear. In this edition additional illustrations and information are given, as well as directions for working the apparatus, and for the upkeep of the switchgear. Diagrams of connections and of the general arrangement of the starting and restarting device are given, and power diagrams and tests that follow are included to show the increased efficiency obtained with the system. We understand that the system is being adopted by many firms in this country, and that a considerable number of orders have been received from abroad.

MESSRS. HARRY W. COX & Co., LTD., 47, Gray's Inn Road, W.C.—This is a very useful catalogue of apparatus with the introduction and manufacture of which the name of Cox has been associated for many years in this country. Mr. Harry Cox, whose name has been recently before the public somewhat prominently, owing to the unfortunate and painful effects upon himself of his pioneering X-ray work, was one of the earliest workers in this field, and the present business has the benefit of his and his co-workers' practical knowledge and experience. The catalogue contains some 160 pages of fully-illustrated matter relating to coils, interrupters, accumulators, switchboards, generators and accessories, X-ray tubes, apparatus for fluoroscopy, radiography, and X-ray treatment, static machines, high frequency and wireless telegraphy apparatus, galvanic and Faradic apparatus, therapeutic lamps, light baths, &c. Particulars of the firm's glass-blowing department are given. The catalogue, which is well set out and has a good index, is one that should be in the hands of all engineers or contractors who have anything to do with the carrying out of electro-medical or surgical installations in hospitals or infirmaries, or upon the premises of doctors and surgeons.

MESSRS. DRUCE & Co., 72, Temple Street, Wolverhampton.—New list of motor starters combined with no-voltage and overload release circuit-breaker. Prices are stated for sizes from 2 to 18 H.P.

Bankruptcy Proceedings.—R. RUSSELL (trading as R. Russell & Co.), electrical engineer, Putney, London.—The public examination of this debtor was to have been held last week at the Court House, Wandsworth. The statements showed unsecured liabilities £768, and assets £617, leaving a deficiency of £151. The deputy Official Receiver (Mr. Knight) told the Registrar that he had not had sufficient time to investigate the property, and he must ask for the examination to be adjourned. Accounts had only just come in, and there were a great many matters which required investigation. Debtor said he did not object, and the case was, therefore, adjourned. The following are creditors:—

Doughty, J. M., & Sons, London	£19
Edison & Swan Electric Co., Ltd., London	16
General Electric Co., Ltd., London	40
Geipel & Lange, London	222
Hands, A. C., London	59
Marsh, Sons, & Co., Ltd., London	23
Martin, J., London	18
Stamper & Son, London	32
Hooper, J. C., London	183
Tucker, J. H., & Co., Birmingham	19
Walsall Hardware Co., Walsall	66
Barberry, T., Richmond	19
Fully-secured creditors	67

C. H. M. A. VERBE, electrical engineer, 5, Park Parade, North Finchley.—At the Barnet County Court, on February 22nd, an application was made for discharge. The receiving order was made in August, 1907, and the examination was concluded in December of the same year. The Official Receiver (Mr. Cecil Mercer) stated that the debtor kept his books—particularly in regard to book debts—in a very bad state. In addition, the debtor must have been insolvent for a long time, and that to his own knowledge. Counsel for the applicant said he commenced business when only 23 years of age, and his mistakes were due to ignorance and want of business capacity. Judge Roberts suspended the order for three years.

Japanese Tariff.—It has been decided that as accumulators and parts of such may be used without dynamos, they shall pay 20 per cent. *ad valorem* under No. 430 of the tariff, instead of 15 per cent. under No. 453 as hereto.

Dissolutions and Liquidations.—British Eastern Electric Power Co., Ltd.—Creditors must send particulars of their debts, &c., to the liquidator, Mr. T. F. Stevens, 57½, Old Broad Street, E.C., by April 7th.

Messrs. Humbert & How, electrical engineers and manufacturers, 3 and 4, Alt Grove, Wimbledon.—Messrs. A. How & L. F. Humbert have dissolved partnership. Mr. Humbert continues the business.

Messrs. Wm. White & Co., electrical and mechanical engineers and merchants, 5, Budge Row, E.C.—Messrs. W. White, T. H. Bacon and C. J. Baker have dissolved partnership. Messrs. White and Bacon will attend to debts, &c., and will continue the business under the old name.

Joseph Richmond & Co., Ltd, Kirby Street, Hatton Garden.—March 10th is the last day for the receipt of proofs by the liquidator, Mr. R. J. Ward, 2, Clement's Inn, W.C.

Universal Engineering Co., Ltd.—A meeting of this company is to be held at 12, Victoria Street, Nottingham, on March 26th, to hear an account of the winding up from the liquidator, Mr. R. T. Flinders.

Electro-Medical Institute, Ltd.—A winding-up order was made at Salford on February 12th.

The Aluminium Corporation, Ltd.—A petition of Brownlie and Murray, Ltd., for the compulsory winding up of this company was dismissed by the Court on Tuesday, as a meeting of creditors had decided in favour of continuing the voluntary liquidation. Mr. Robertson Lawson was appointed to act as joint liquidator with Mr. A. H. Gibson and a committee of inspection.

McPhail & Simpson's Dry Steam Patents Co., Ltd., Calder Works, Wakefield.—A fourth and final dividend of 7d. in the £ is payable on March 5th by Mr. J. W. Close, East Parade, Leeds.

Sirocco Mine Fans in South Wales.—We learn that a large number of the principal mines in South Wales are adopting the Sirocco fan for ventilating purposes, among them being the group comprising the Cambrian, Glamorgan and Naval Collieries, the underground roadways of which aggregate about 130 miles. At the Cambrian the fan is to be a double inlet Sirocco 14 ft. in diameter, capable of exhausting three-quarters of a million cubic feet of air per minute. It will be driven by a 2,000-H.P. engine. The fan at the Naval Colliery will also be of the double inlet type, measuring 10 ft. 6 in. in diameter, with a capacity of 400,000 cb. ft. The third fan of the group, that of the Glamorgan Coal Co., has been in operation for some months, and we understand that at a recent official test it showed a fan efficiency of over 80 per cent. This fan is a double inlet Sirocco 11 ft. 8 in. in diameter, and has a capacity of 340,000 cb. ft. per minute. The same type of fan has also been adopted by neighbouring collieries, such as Feradale (D. Davis & Sons) where the three fans installed show exceptionally high efficiencies. Among other Welsh collieries Sirocco fans are also being installed at the Atlantic Merthyr colliery and the Penallta pit of the Powell Duffryn Co., that for the latter being 12 ft. 10 in. in diameter, and designed for a duty of 500,000 cb. ft. per minute.

Book Notices.—*Controle des Installations Electriques (Appendice).* By A. Monmerqué. Paris: Ch. Béranger. 1909.—This is an appendix to the author's original volume, and contains the French "Law of June 15th, 1906," together with its riders, decrees, regulations and circulars, the whole constituting chapters 15 and 16 of the complete work. The law in question covers the whole field of concessions for the distribution of electrical energy, regulations for the execution of electrical schemes under various heads, and the formation of a permanent Committee of Electricity, consisting of 30 members, charged with the duty of advising the Government departments on important electrical questions arising from time to time. The contents of the volume include all such matters as are dealt with in our Board of Trade and Home Office Regulations, and it will undoubtedly prove very convenient and useful to those who have to carry out electrical work in France.

"Electrical Installations." By Rankin Kennedy. New Edition. London: Caxton Publishing Co. 1909. Price 7s. 6d. net.

"Estado Actual de la Electrometalurgia del Hierro." Madrid: Adrian Romo. Price 3 pes.

"Electric Lamps." By M. Solomon. London: A. Constable and Co., Ltd. 1908. Price 6s. net.

"One and All Gardening, 1909." Edited by E. O. Greening. London: Agricultural and Horticultural Association. 2d.

"Handbook of Wireless Telegraphy." By J. Erskine-Murray. London: Crosby Lockwood & Son. 1909. Price 10s. 6d. net.

Engineering Exhibition for Manchester.—We are informed that at a representative and influential meeting held at the Midland Hotel, Manchester, on February 17th, Mr. W. T. Stubbs (Messrs. J. Stubbs, Ltd.), in the chair, a resolution was passed approving of a general Engineering and Allied Trades Exhibition being held in Manchester during the autumn of 1910, on the lines laid down by the International Trade Exhibitions, Ltd., London. It was also resolved that the Provisional Committee be reappointed, with power to add to their number.

Sparking Plug.—A new sparking plug has been put on the market by Mr. R. F. Hall, of 137, Suffolk Street, Birmingham. These plugs are so constructed that they can be easily repaired. The plugs are made to standard sizes, and it is claimed that they are perfectly protected against soot and oil. Hitherto a want of standardisation has resulted in a considerable waste in throwing away sparking plugs that are not capable of easy repair.

LIGHTING and POWER NOTES.

Ashton-under-Lyne.—The T.C. has applied to the L.G.B. for a loan of £2,040 for a new boiler and induced-draught fan at the electricity works.

The T.C. has reduced the price of energy as under:—Lighting, from 3½d. per unit for the first 250 units per quarter, and 3d. net for the next 250, to 3d. for the first 500 units; power, first 250 units per quarter 1½d. per unit, next 250 1½d., next 500 1d., next 1,500 ·9d., next 2,500 ·8d, next 15,000 ·7d; beyond 20,000, ·6d. Meter rents have been reduced from 1s. 6d. per quarter to 1s.

Ayrshire.—Dumfries House, one of the largest mansion houses in Scotland, with the home farm and adjoining buildings, is to be equipped with electric light, and electric power is to be supplied to a threshing mill and a saw mill on the Cumnock Estate. Acting on instructions received from the Marquis of Bute, a scheme has been prepared by James E. Sayers & Caldwell, of Glasgow, who recently completed a water-power installation for electric lighting and domestic water supply at Mochrum Castle, another of his Lordship's Scottish mansions, and Messrs. T. M. MacKay & Co., Ayr, have been entrusted with the carrying out of the contract to their instructions. The installation will comprise a 40-B.H.P. two-cylinder Diesel engine running on shale or Texas oil, direct coupled to a B.T.-H. dynamo-booster set, and a storage battery of 56 Tudor cells will be provided having a capacity of 970 ampere-hours, with end regulating cells switched in automatically by a Bertram Thomas regulator fitted on the main switchboard. There will be over 800 105-volt metallic-filament lamps and several motors connected to the installation. The wiring will be carried out with solid drawn steel conduit, except at ceiling fitting points, where flexible steel tubing with brass screwed connectors of special design will be used to facilitate exact adjustment of the joint boxes for flexible conductors, to convenient positions above small holes bored in the decorated ceilings, and also at certain points for carrying main and sub-main cables. The underground mains, vulcanised bitumen insulated, will be laid solid in wood troughing.

Birmingham.—The Electricity Committee will lay before the meeting of the Council in March, a report showing that the output has grown since 1904 to 1908 from 4,367,164 units to 9,600,894, and it is estimated that this year the total will be 12,792,000 units. The Council will be asked to apply to the Local Government Board for sanction to borrow £15,000 in respect to high-tension switchgear, £2,000 in respect to transformers, and £20,690 in connection with the fitting up of Dale End sub-station. In 1907 the Council agreed to a loan for £80,000 for additional mains, and it was then estimated that this amount would be sufficient for three years, but, owing to the rapid increase in demand, further outlay is necessary, and the Committee recommends application for a loan of £100,000, which, it is estimated, will be sufficient for the next three years. The total amount of loans required is £149,350.

The Electric Supply Committee has recommended a revised list of charges, viz.:—Ordinary lighting, from 4d. per unit for less than 1,000 units per quarter, to 2d., for 50,000 units and upwards per annum, with a special extra discount of 5 per cent. Long-hour lighting, under 1,000 units per quarter, 2½d.; 1,000 and upwards, 2d., with 5 per cent. discount for 50,000 and upwards per annum. Power supply, at rates varying from 1·35d. per unit for under 1,000 units per quarter, to 1·1d. for 60,000 units and upwards. Restricted hour lighting, 3·1. to 2d. per unit according to quantity. Block arc lighting, for a minimum of four 8-ampere arc lamps on any one service, £5 per lamp per annum of 420 hours, and 2d. per hour in addition beyond that time. Standby supply, a minimum charge of £4 per annum per KW. of possible maximum demand. Energy to be used up to this value at ordinary rates without further charge, and excess current to be charged at the ordinary rates.

Brechin (Forfarshire).—At the Valuation Appeal Court an appeal was recently stated on behalf of the North of Scotland Electric Light and Power Co., against the valuation of the electric light station in Bog Road at £360, and of the company's mains and cables at £300. The previous valuation was £200, which the company maintained was the just amount. The Magistrates at the lower Court fixed the total valuation at £400. The Appeal Court reversed this, and fixed the sum at £200. Lord Mackenzie remarked that the onus was on the assessor to show that there was good ground for altering what had been the figure at which the valuation had stood, and all that their Lordships knew in regard to that company was that there had been a drop in net revenue and not an increase, and for the Court to put up the valuation without being in possession of the materials which might quite rightly have influenced the Magistrates, would not be safe, and might lead to injustice.

Brighton.—The T.C., on February 18th, adopted the report of the Lighting Committee recommending the erection of three new boilers, &c., at the Southwick power station, at a cost of £15,370.

Canada.—The town of Merriton, Ontario, has installed a municipal electric lighting plant, beginning operations on January 29th. A feature of the system is the introduction of tungsten street lamps and their control entirely from the station by automatic means.

The City of London has about completed negotiations with the London Electric Co. for purchasing its plant, valued at $500,000.

The result of the year's business of the Ottawa Electrical Co., owned and operated by the city, is very satisfactory. After adopting new rates, which were just half those in force in the past, there was a net profit for the year of $15,000.

In view of the large development of water-power which will result from the completion of the Trent Valley Canal across the province of Ontario, the Minister of Canals is about to lay down a policy which will ensure the sale of this power to individual users at reasonable rates. When this power is sold to the public as electric energy, the Board of Railway Commissioners will regulate the price.

Cardenden.—The Cardenden Gas Co. has been registered to manufacture and sell gas, electricity, &c., to the villages of Auchterderran, Bowhill, Cardenden, and district.

Continental Notes.—Austria-Hungary.—The Auer Electric Works in Tramin (Tyrol), which has been supplying electric light for five large districts in South Tyrol for the last eleven years, is about to erect new electrical works in order to keep pace with the increasing demands.

A large central electric generating station is about to be erected in Dubitzko (Mähren); and the local authorities at Sexton (Tyrol) contemplate erecting electrical works there.

Germany.—According to a daily paper, the congregation of a church at Miltitz, near Dresden, had a narrow escape from gas poisoning the other day. When it was realised that a considerable leakage of gas was taking place, a stampede apparently took place, blocking the doors and imprisoning those behind, and with serious consequences, as all the choir and a large number of the congregation were overcome by the fumes. Fortunately, some one broke a few windows, otherwise the numerous doctors who were called in would have been unnecessary. Gas papers please copy.

Coventry.—The City Council on Tuesday received a report from the Electric Light Committee stating that the L.G.B. could not see its way to alter the decision that the sum of £4,250 (representing the cost of plant for supplying steam to the electric light works), in connection with the refuse destructor, must be treated as a charge upon the electric light undertaking. The Committee has resolved to confer with the General Works Committee with a view to the Electric Light Committee taking the burden of the annual payments of interest and sinking fund, subject to the same being repaid by the General Works Committee as part of the expense of the refuse destructor scheme.

Dundee.—There is a good deal of disappointment as to the progress of the new electrical generating station at Carolina Port. It was thought that the buildings would be ready by the spring, and that the pressure on the old station would then be relieved, but it is now stated that it will be some months before it is possible to generate at Carolina Port. Meantime it is reported that several prospective power users, one of them being a large power user, are likely to reconsider their position as so taking energy from the Corporation on account of the delay.

Dunfermline.—The T.C. has resolved to apply to the B. of T. for a provisional order authorising the Council to transfer and assign the Dunfermline and District Electric Lighting Order to the Fife Electric Power Co. It was pointed out that this was not a transference of the provisional order for all time.

Falkirk.—Sir Alex. Kennedy has been appointed consulting engineer, and has been asked to report on the electric light undertaking, and with regard to providing for future extensions, costs, &c.

Hanley.—At the meeting of the T.C. last week, on the consideration of the minutes of the Electricity Committee, it was resolved "That the Works Committee be requested to authorise the improvement of the street lighting, in the centre of the town, and that the Electricity Committee will willingly assist in the matter." Messrs. M. Huntbach & Co., one of the largest trading firms in the town, who are extending their premises, wrote that they found they could produce electricity for lighting purposes at a cheaper rate than it could be purchased from the Committee, but they were prepared to make an offer to the Committee. They were prepared to pay £300 per annum, rather than deprive the borough of their custom, and they estimated their maximum demand to be 64 kw., and consumption in 12 months at not more than 40,000 units. The Council decided to offer a price of 3d. per unit at night, and power rates during the day.

High Wycombe.—The T.C. on February 17th considered a recommendation to install electrical pumping plant at the waterworks; energy to be supplied by the electric light company. The estimated cost of pumping by electric power was placed at £526 per annum; the motors and pumps would cost £880; and wiring, &c., £80. Several members suggested that it would be more economical for the Council to produce its own energy by means of a suction gas plant, and the matter was referred back to Committee for this suggestion to be considered, it being estimated that the adoption of this course would save £226 a year.

Huddersfield.—The electricity revenue for the year ending December 31st last amounted to £31,614, compared with £30,354 in the previous year; and the gross profit to £12,014 as compared with £10,984. After meeting financial charges a surplus of £550 remained.

Kirkby-in-Ashfield.—The B. of T. has revoked the 1904 E.L. order.

Leeds.—The Tramways and Electricity Committee estimates that during the coming year the income from the sale of current will amount to £108,188, as compared with £104,280 estimated for the year just closing. The estimated expenditure is £95,881, of which £24,431 is put down as works costs. There is an estimated surplus, subject to allocation to reserve, of £12,307.

Littleborough.—The B. of T. has notified the U.D.C. that it will defer consideration of the question of revoking the Council's provisional order for 12 months now that the latter has adopted an electric lighting scheme.

Liverpool.—The estimates of expenditure on account of the electric light department presented to the City Council, contained a proposed expenditure of £31,000 on the Lister Drive power station. At the meeting of the Council on Thursday, a request was made to postpone this matter. Mr. Harrison Jones viewed with alarm the proposal to take £24,000 from the reserve and renewal account; Sir Chas. Petrie, chairman of the Electricity Committee, explained that the expenditure of £31,000 proposed on Lister Drive station was part of the money applied for last year and sanctioned by the L.G.B. They had postponed the spending of that money until this year, and now they were only proposing to use half the amount sanctioned. There were seven turbines at work in Lister Drive station, sometimes at their full capacity, therefore it would not be wise to postpone the equipment of extra turbines. By having the turbines, they last year saved something like 10,000 tons of fuel. With regard to the £24,500 to be taken from the reserve and renewal account, that was really to put Pumpfields station into better condition. The Committee's recommendation was confirmed.

Llandudno.—The U.D.C. has requested the Electricity Committee to consider and report upon the question of doing by its own staff, work which is now done by electricians in the town, such as renewing lamps, re-wiring, &c., on premises belonging to the Council.

London.—Marylebone.—The gross income of the electricity undertaking during the December quarter was £56,591, as compared with £55,646 in the corresponding period of 1907. The gross expenditure was £12,777 as against £16,529 in 1907. The units sold to private consumers show an increase over the 1907 quarter of 147,297 bringing the total for the three months to 2,980,860. The average price per unit obtained from private consumers was 4·35d. as against 4·50d. in 1907. If meter rentals are included the cost per unit was 4·45d. as against 4·63d. in 1907. As compared with 1907 generating expenses show a decrease of 22 per cent. to ·531d.; distribution expenses a decrease of 10 per cent. to ·142d.; management expenses a decrease of 20 per cent to ·159d., and rents, rates and sundries a decrease of 5 per cent. to ·136d. The total cost per unit sold worked out, for December, 1908, at ·972d. as against 1·205d. in the corresponding period of 1907, and 1·206d. in 1906.

Manchester.—At the annual meeting of the shareholders of Messrs. Beyer Peacock & Co., locomotive builders, Gorton, last week, the chairman announced that they had made an arrangement with the Manchester Corporation for the supply of electrical energy for power purposes. The charges agreed upon were mutually advantageous; it was, in fact, cheaper for them to take their current from the Corporation mains and to scrap their own electrical generating plant, writing the cost of the same off over three years.

Penrith.—Some years ago the U.D.C. obtained a prov. order for electric supply, but never carried out its powers, inasmuch as the gas works belong to the town and make good profits every year; this profit has been used towards reducing the general district rate. The order has now been taken over by the Penrith Electric Supply Co., which is erecting a generating station and laying down a supply system. The power house is situated in the centre of the town; the plant which will be installed at present, consists of two complete suction gas plants, and two horizontal type Crossley gas engines of 60 b.h.p. each, direct-coupled to two 40-kw. direct-current generators. The distributing system is of the three-wire description with a voltage on the outers of 220, this system lending itself to the use of metallic-filament lamps. The usual balancers, boosters, and a 180-ampere battery are being installed. The cables are being supplied by Messrs. Henleys, and are three-core, lead-covered and armoured.

Radcliffe.—Despite the strong and strenuous opposition offered at the L.G.B. inquiry last December, the local Council has now received sanction, subject to certain requirements, for the extension of the electricity undertaking.

Rugby.—At the meeting of the U.D.C. last Thursday night, Mr. Wilson's proposal to convert the street lighting of the town from gas to electricity was again considered. Mr. C. Meiklejohn, engineer to the Rugby Gas Co., made a speech, in which he suggested that Mr. Wilson's proposal arose from three points—bluff, greed and ignorance—bluff, because he thought he could make the gas company quote very much lower terms; greed, because he was associated with the present supply firm (the British Thomson-Houston Co.), who must be netting a profit of £1,500 a year; and ignorance, because he did not know the number of members of the Council likely to accept his scheme without any regard to the effect it would have on the rates of the town. After a prolonged discussion, the matter was referred to a special committee for it to report.

Saddleworth.—The B. of T. has revoked the 1902 E.L. order.

South Africa.—Cape Town.—In the abstract of probable revenue and expenditure of the Corporation for the year 1909, the following items appear under the heading of electric light works, viz.:—

Supply of current to private consumers—Cape Town	£40,000
Supply of current in Woodstock	2,255
do. for public lighting	8,550
do. for Corporation purposes ...	2,100
do. to Colonial Government (part of year)	3,250
Miscellaneous revenues	600
	£56,755
Expenses of management	4,526
Working expenses	18,048
Miscellaneous charges	750
Maintenance and renewal of plant	9,245
Depreciation	8,200
Interest and sinking fund	13,108
	£53,877

Tewkesbury.—The T.C. has leased the E.L. order to the Electric Light Co., which has paid the Council £300.

Tynemouth.—The T.C. has decided to petition against the County of Durham Electric Supply Co.'s Bill.

TRAMWAY and RAILWAY NOTES.

Aberdeen.—Councillor Young has given notice for a remit to the Tramways Committee to obtain powers for the construction of a tramway in Market Street, to connect the Torry tramway with the Union Street and George Street lines.

Accrington.—Some opposition was offered on Monday at an official inquiry here respecting an application for a provisional order to authorise the construction of a light railway between Clayton-le-Moors and the Lancashire and Yorkshire lines near Accrington or Huncoat Stations. The total length will be a little over 2¼ miles and the estimated cost is £24,000. The decision of the Commissioners was adjourned.

Belfast.—At the weekly meeting of the Electrical and Tramway Committee on the 22nd inst., a motion to have counsel's opinion on the proposed agreement between the Cavehill and Whitewell Tramway Co. and the Corporation resubmitted to the company was discussed, and also an amendment to drop the scheme. The motion was carried by the casting vote of the Lord Mayor. Despite retrenchment, the Corporation tramways system is not paying, and further retrenchments are spoken of.

Continental Notes.—Italy.—The Municipal authorities of Marino have voted in favour of electrifying the present railway, which will be extended to Rome, where a station will be built at the Via Principe Amedeo.

Italy.—A fatal tramway accident occurred on Sunday last, near Naples, owing to a car which was drawing a trailer running away on a hill. Four people were killed, 19 seriously and 14 slightly injured.

Holland.—Messrs. Löben Sels and van den Berg have applied to the municipal authorities of Loosduinen for a concession for the construction of an electric tramway from Scheveningen to Hoek van Holland, through Kijkduin, with a branch from Kijkduin to Delft through Loosduinen.

Glasgow.—The T.C.'s Sub-Committee on Works has recommended that the department should provide a challenge cup, to be competed for by the employés in the department who are members of the Territorial Forces.

The general manager has been asked by the T.C. sub-committee to arrange terms upon which members of the Territorial Force of the city should be entitled to purchase tramway tickets while on Territorial duty.

The Sub-committee on Extensions is considering the extension of the tramway route to Springburn Park *via* Balgrayhill—three-quarters of a mile.

Hull.—The success of the Corporation electric tramways has been such during the year that it has been decided to allocate £18,000 out of the profits to the relief of the rates. The estimated revenue to March 31st, 1909, is £128,691; the estimated expenditure, including interest and sinking fund, £106,282, leaving a profit of £22,409. Last year the profits were £29,895, so that the profits this year are estimated to be down £7,486. The reduction in the profits is largely attributable to the ½d. cars, which are now run before 9 a.m., it being possible to travel three miles for a ½d. The advisability of handing over such a large amount to the relief of rates was questioned by several members of the Corporation, but Alderman Larard pointed out that the proposition was sound finance, as they had a reserve fund amounting to within £11,000 of that which they were allowed to hold. A proposition that the amount to be given to the rates should be £15,000 was only supported by a couple of votes. It may be mentioned that the reserve fund now amounts to over £97,000, the statutory possible amount being £108,000, and while we have little sympathy with promiscuous subsidising of the rates, it must be admitted that, so far as one can judge, the financial position of the Hull tramways undertaking leaves little to be desired.

Leeds.—Considerable progress is being made in the construction of the Guiseley and Horsforth section of the Corporation tramways, about half the work being complete. It is expected that the route will be opened in the autumn.

Leicester.—At a meeting of the T.C. on Tuesday, the annual receipts of the tramways department were adopted, showing that the total revenue for the year 1908 amounted to £117,793, an increase of £947. The passengers carried numbered 27,411,286, a decrease of 5,941, and the cars ran 3,334,136 miles, a decrease of 788 on the previous year. The working expenses amounted to £71,653, an increase of £765 over last year. The gross profit amounted to £46,140, against £45,958 last year, and the net balance to £11,350, as against £10,538.

London.—The Highways Committee of the L.C.C. recommends that an agreement should be entered into with the Metropolitan Electric Tramways, Ltd., for the company to extend the Harrow Road tramways to Edgware Road, and work same for a period of 21 years. The company is, by agreement, also to work the existing tramways in Harrow Road, situated in London.

Milnrow.—The Rochdale Tramways Committee on Wednesday last week, approved the basis of agreement for negotiating with representatives of the Milnrow Council with a view to extending the tramways into the Milnrow district.

Morecambe.—At the annual meeting of the Morecambe Tramways on Monday, it was stated that the number of passengers carried was 1,166,836, compared with 1,830,866 last year. There was also a substantial decrease in the receipts, attributable to the unfavourable weather for holiday-makers during July, August and September. A dividend of 3 per cent. was agreed to. Reference was made to the recent arbitration case, in which the Corporation has to pay £13,391 to the tramways company for the undertaking so far as it relates to that part in the Morecambe borough. The company will continue to work the Heysham section.

Rhondda.—The tramway men employed by the Rhondda Tramways Co. came out on strike on Saturday, and traffic was disorganised during the morning and afternoon, but several meetings were held between Mr. Nisbett, the manager, and the representatives of the men, with the result that terms were agreed upon at 4 o'clock and the system was quickly in working order again.

Rhyl.—The Light Railway Commissioners on Friday held an inquiry relative to an application to construct a light railway from the harbour at Rhyl, along the promenade and across the sand fringing the shore, to Prestatyn. The scheme is not a new one, and matters had progressed so far with a similar proposal in 1900, that the Rhyl Council expended about £30,000 on electricity works to supply energy, and erected standards to accommodate the overhead equipment. Owing to want of capital, however, the scheme was abandoned, and the powers for the work lapsed two years ago. There was considerable opposition on Friday, and on the Commissioners stating that in face of this they could not grant an order, an application was made for an adjournment of the inquiry so that a vote of the ratepayers might be taken. The Commissioners agreed to this course, and suspended their decision for a month.

Torquay.—A deputation of the T.C. has had a long interview in London with the officials of the Tramway Co., which is seeking Parliamentary powers to extend the lines from the Torquay Railway Station to Paignton. As a result, the negotiations having been of a very complicated character, terms have now been arrived at, under which consent has been given for the company to extend the tramway from the present terminus in the Torbay Road to the borough boundary, near the Gas Works on the road to Paignton. The overhead system will be adopted in the extension to Paignton, and the Torquay Corporation will supply the motive power to run the cars as far as the borough boundary. Sunday travelling is to be permitted on the extended line on the same conditions as at Torquay—from mid-day to 10 p.m.

TELEGRAPH and TELEPHONE NOTES.

Germany and the Message Rate.—Accepting the inevitable, the German Government proposes to adopt the message rate system for telephone service, charging £5 per annum and ½d. per call. The subscribers, in accordance with precedent, are raising the usual clamour on the score of a feared increase in their payments, but in the end the system will be adopted.

Naval Signalling.—A considerable number of experiments are going to be carried out during the forthcoming cruise of the Home Fleet in connection with concentration of gunfire. For this purpose the *Commonwealth*, battleship, has shipped a quantity of electrical gear at Devonport. The *Jupiter* also has been preparing for experiments in the same direction with a view to signalling in a manner independent of the ordinary methods of wireless telegraphy.

New Cable Steamer.—*Retriever* is the name of a new cable-repairing steamer which is being built by the Goole Shipbuilding and Repairing Co. She will be stationed on the west coast of South America when completed.

Telegraphic Interruptions:—

Port Arthur-Chifu	March 9, 1904
Pontianak-Saigon	Sept. 16, 1908
Malta-Zante	Dec. 29, 1908
Tourane-Amoy...	Jan. 19, 1909
Oran-Tangier	Feb. 20, 1909

Wire Thefts.—A large quantity of copper wire has been stolen from the line of the post office telephone trunk service running from Barrhead to Glasgow. More than 19 wires were cut, and portions of from 50 to 60 ft. carried away. For a time the system was completely disorganised.

Wireless Telegraphy.—During the recent fleet exercises at night, which are carried out with all lights masked in order to avoid detection by opposing destroyers, one or two instances occurred of the whereabouts of the fleet having become known on account of the door of the wireless telegraph office having been opened, emitting a glare which was visible a considerable distance away. The Admiralty have accordingly ordered that all ships which have offices on the upper deck are to be fitted with a device attached to the door which will switch off all lights upon the door being opened.

The Marconi Co. has received an order from the Brazilian Government to equip four land stations in the neighbourhood of Rio de Janeiro. The company has also received orders from the White Star Steamship Co. to fit three more of their ships. The Norddeutscher Lloyd steamers will soon have 17 Marconi installations in operation on their Atlantic fleet.

The Board of Trade is considering the advisability of introducing legislation requiring all British-owned ocean-going steamers to carry efficient wireless telegraph equipment. At present some 70 vessels are fitted with apparatus.

CONTRACTORS' COLUMN.

[The following information is published in the interests of electrical contractors and others who are seeking for openings for new business. Considerable expense is incurred in the production of this column, and every care is taken to ensure that the information is new and accurate, but it will be understood that in a matter where so many correspondents are engaged, and where the amount of information to be handled is very large, this cannot always be guaranteed. If alleged inaccuracies are reported to the Editors, they will be fully investigated.]

ABERDARE.—New laboratory, &c., for Council School (£4,380); T. M. Franklin, Clerk to the Glamorgan C.C., Cardiff.

ABERYSTWYTH.—Alterations at Snowden House, for Sir J. Williams.

ACTON (CHESHIRE).—Proposed village hall: Vicar.

ALDERSHOT.—Royal Artillery Mess, Wellington Lines, to be lit by electricity. Secondary school (£3,000); F. C. Uren, Town Hall, Aldershot.

ANNAN (N.B.).—Waterworks scheme (£50,000); Barbour & Bowil, architects, 53, Buccleuch Street, Dumfries.

ARMATHWAITE.—Elementary school (£3,729); G. D. Oliver, architect, Carlisle County Council; E. Musgrave, builder, Court Street, Carlisle.

ASCOT.—Additions to Earlywood School, for Miss Sandwith.

ATHERTON.—Workmen's dwellings; F. Grimshaw, architect, Atherton.

BARGOED.—Thirty houses at Groesfaen, for the Rhymney Iron Co., Ltd; J. L. Smith, architect, Aberdare.

BARNARD CASTLE.—Stag's Head Inn, Butterknowle, to be rebuilt; Newcastle Breweries Co., Newcastle-on-Tyne.

BARNSLEY.—Alterations and additions to Ardsley United Methodist Church; P. A. Hinchliffe, architect, 14, Regent Street, Barnsley.

BATH.—New soap works at Tiverton, for Messrs. Chivers; Chancellor & Son, builders.

BEDFORD.—Seven houses in Aspley Road; B. Litchfield & Son, 9, Ombersley Road, Bedford. Six houses in George Street; G. Williamson, 6, Dudley Street, Bedford. New meeting room, &c., at Working Men's Club, to hold 300, in Millbrook Road; Mr. Pearson, secretary, Southend Working Men's Club. Motor garage in Beckett Street; T. B. Course.

BEDWAS (near CARDIFF).—New colliery; Bedwas Navigation Colliery Co.

BEXHILL.—Six detached houses, Woodville Road; J. W. Webb, owner; J. B. Wall, architect, 13, Devonshire Road, Bexhill.

BIRMINGHAM.—Probable restoration, after fire, of premises in Caroline Street, for W. H. Swinglewood, jewellers' case-maker. Probable reconstruction, after fire, of premises at Sand Pits, for the New Hudson Cycle Co. (damage, £7,000 to £8,000).

(WITTON).—Prospective rebuilding, after fire, of portion of Lion Works, for Messrs. Kynoch.

BLACKPOOL.—New church; Rev. J. Rous Presland, minister, New Church, Blackpool. Electrically driven pumps at municipal sea-water works: Borough Engineer, Blackpool. Infants' school (£6,000); J. S. Brodie, Borough Surveyor, Blackpool.

BOGNOR.—Additions to the isolation hospital (£3,000); P. A. Bridge, borough architect, Bognor.

BOLTON.—Probable reconstruction, after fire, of cotton mill, Gaskell Street, for the Park Mill Spinning Co.; Mr. Sharples, manager (damage, £5,000 to £6,000). New cricket pavilion at Egerton, near Bolton; Secretary, Egerton C.C. Sewerage works at Breightmet; Borough engineer, Bolton. Extension of premises; Morris, furnisher, St. George's Road.

BOOTLE (near LIVERPOOL).—Probable re-erection, after fire, of cotton warehouses, Baltic Road, for A. V. Paton & Co., Orleans House, Edmund Street, Liverpool (damage, £20,000).

Rebuilding warehouse, after fire; Alderman W. Jones.

BOURNEMOUTH.—Probable re-erection, after fire, of premises, for J. J. Allen, Ltd., house furnishers, The Quadrant (damage, £10,000).

BRADFORD.—Conversion of mission hall into skating rink; local syndicate.

BRENTFORD.—Five houses and three shops, Bollo Lane; J. J. Fuller, builder, 63, Ivy Crescent, Chiswick. Billiard room, rear 264, High Street, for the Brentford Conservative Club.

BRENTWOOD.—Important sewerage and sewage disposal works for the U.D.C. (£20,000); Mr. Willcox, engineer.

BRIDGEND.—Nursery block for cottage homes; P. J. Thomas, architect, Bridgend.

BRIDLINGTON.—Palm house (£1,500); E. R. Matthews, architect, Council offices, Bridlington.

BRISTOL.—Chancel, Vestries, &c., at St. Anne's Church, Brislington; H. M. Bennett, architect, 36, Corn Street, Bristol. Church of St. Ambrose, Fishponds (£10,500); W. V. Gough & A. Gough, architects, Bristol. Skating rink, Rupert Street, for Rinking, Ltd., Empress Hall, Earl's Court, London.

BURGHILL.—Isolation hospital; R. A. Jack, architect, Hereford.

BROMLEY.—Additions to and re-arrangement of Cottage Hospital; J. Yalden Hay, secretary.

BROOMFIELD (ESSEX).—Public Elementary School; J. H. Nicholas, secretary, Essex Education Committee, Chelmsford.

BUCKHAVEN (FIFE).—New buildings for Wemyss Coal Co.; clerk of works, Wemyss Coal Co., Buckhaven.

BURSLEM.—Sewerage scheme for the T.C. (£3,800).

BURY.—Alterations at Masons' Arms, Rayners' Vaults and Clarence Hotels. Sewerage works at Ainsworth (£7,000); Bury Rural District Council.

BUXTON.—Additions to London Road Primitive Methodist Church; Bryden and Walton, architects, George Street, Buxton.

CAERPHILLY.—New school at Aber; T. M. Franklin, clerk to the Glamorgan C.C., Cardiff.

CALVERLEY.—Extension to mills for J. Walton & Co., woollen manufacturers; W. A. Baker, Calverley Chambers, Leeds.

CAMBUSNETHAN.—School (£6,500); J. Cowie, architect, Cleland Road, Wishaw, N.B.

CARDIFF.—Rebuilding of business premises, 5a, High Street, for H. H. Chiesman. New Institute for St. Andrew's Parish; Rev. G. L. Richardson, vicar.

COWES (ISLE OF WIGHT).—New mission church and Sunday School in Newport Road.

CREDITON.—New church rooms.

CROYDON.—Houses, Northborough Road, Croydon, and Palmer's Road, Norbury; W. E. Riley, superintendent architect to the L.C.C., Spring Gardens, W.C. Twelve houses, Ashurch Road; J. W. Hall, Beckenham. Twelve houses, Nutfield Road; H. Hemming, 19, Totton Road, Thornton Heath. Additions to mission hall, Mersham Road, Thornton Heath; Whiting & Ford, London, W.C.

CUDWORTH (YORKS.).—Houses (28) in Pontefract Road, for F. T. Salmon and Co.; two houses and shops, Pontefract Road, for Mrs. Garner Mitchell.

DALMUIR (GLASGOW).—Catholic Church; F. Burke, architect, 348, Cumbernauld Road, Glasgow.

DARLINGTON.—Alterations to Holy Trinity Church; C. H. Fowler, architect, The College, Durham.

DENNY (STIRLINGSHIRE).—New police station; E. Simpson, architect, 16, King Street, Stirling.

DEWSBURY.—Large workshop, Watergate; Kirk, Sons & Ridgway, architects, Market Place, Dewsbury.

DONCASTER.—Alterations to business premises, Market Place and Hall Gate, for Parkin & Sons, house furnishers.

DORKING.—Hospital for the Dorking and District Isolation Hospital Committee; W. Shearburn, architect, South Street, Dorking.

DROYLSDEN.—Large house in Fairfield Fields; Mr. Eagle.

DUBLIN.—Additions to Prescott dye works; F. Higginbottom, architect, 17, Lower Sackville Street, Dublin. Additions to the Queen's Theatre (£5,000); R. Stirling, architect, 24, Clare Street, Dublin. Warehouse for the British and Irish Steam Packet Co.; Byrne and Son, architects, Suffolk Street, Dublin. Rebuilding 13, Trinity Street for warehouse or offices; S. H. Ballon & Sons, contractors, Rathmines, Dublin.

DUDLEY.—New skating rink, Claughton Road, for the Dudley Roller Skating Company.

DUNDEE.—New drill hall, for Artillery and Army Medical Corps (£3,700); L. Ower, architect, Dundee.

DUNFERMLINE.—Seven villas, for J. Robertson, slater, Campbell Street; alterations at Hawthornbank, for Wm. Robertson, manufacturer. Extension of aerated water manufactory and other buildings at Transy, for Scottish Co-operative Wholesale Society, Ltd.; G Crichton, solicitor. Alterations on County Buildings.

EASTLEIGH (HANTS.).—Six houses, in Chamberlayne Road; G. F. and T. Hedges, builders, Eastleigh, Hants. Seven houses at Newtown, Eastleigh; A. C. Harrison, Newtown, Eastleigh, Hants.

EASTWOOD.—County school (£10,000); L. Maggs, architect, Shire Hall Nottingham.

EDINBURGH.—Twelve tenements at Falcon Avenue, Falcon Gardens, and Falcon Road, for J. W. Cruickshank.

ELLAND.—Proposed new secondary school; L. Clegg, Holywell Green, near Halifax.

ERDINGTON.—Offices and library; W. Humphries, Council House Erdington.

EXMOUTH.—Cookery centre; P. Morris, architect, Richmond Road, Exeter.

FALKIRK.—Reconstruction of property at Gartcows Road, Parkfoot, for Geo Bowers, Hillhead, Glasgow.

FAZAKERLEY.—Parochial hall; F. Rimington, architect, North John Street, Liverpool.

FENTON (STAFFS.).—Fire station and other premises for the U.D.C.; S. A. Goodall, surveyor to the Council, Town Hall. Addition to Meigh's Mill, Lytton Street; The Potters Mills Co.

FROME.—Pumping station and refuse destructor; F. Jones & Son, architects, Frome. School, Milk Street (£3,500); A. B. Cottam, architect, Bridgewater; G. Moore & Co., builder, Trowbridge.

GATESHEAD.—Parish hall, St. George's; Mr. Wylie, West Street, Gateshead.

GILFACH-FARGOED.—Girl's school for 300; T. M. Franklin, clerk to County Council, Cardiff.

GLASGOW.—Proposed extension of the Corporation slaughter-houses; A. B. M'Donald, City engineer. Prospective rebuilding, after fire, of the Scotstoun Flour Mills, for J. White & Sons, Partick and Glasgow (£20,000 damage). Block of offices, Oswald Street; J. Craig, architect, 219, St. Vincent Street, Glasgow. Extensions Barr and Stroud's factory, Anniesland (£5,000); Douglas & Patterson, architects, 266, St. Vincent Street, Glasgow.

(JORDANHILL).—New pavilion for the Woodend and Lawn Tennis Club; W. H. M'Nab, architect, 121, West George Street, Glasgow.

GOLDTHORPE (near ROTHERHAM).—Proposed new hotel, for S. Hamilton builder.

GOSFORTH (CUMBERLAND).—Alterations and additions to shop and stores, for the Egremont Co-operative Society; W. G. Scott & Co., architects, Workington.

GREAT STANMORE.—Bank and house and four shops and houses for London and South-Western Bank, 170, Fenchurch Street, E.C.

GREENFIELD (LANCS.).—Mechanical filter house at Ashway Gap, in connection with the Ashton-under-Lyne, Stalybridge and Dukinfield Waterworks; F. J. Dixon, waterworks engineer, engineer's office, Town Hall Chambers, Ashton-under-Lyne.

GRIMSBY.—Proposed extension of Town Hall (£30,000); borough surveyor, Grimsby.

GUISBOROUGH.—Sixteen houses, Hedley Street, for the Co-operative Society.

HAILSHAM (SUSSEX).—Premises for the London and County Bank (£4,000); Mr. Burtenshaw, architect, Hailsham.

HARROGATE.—Extensive alterations to business premises, Commercial Street, for the Grand Polytechnic Stores, drapers.

HAYWARD'S HEATH.—Proposed new business premises, South Road, for E. Cole.

HEAVITREE (DEVON.).—Extension of the Sanatorium for the U.D.C. (£1,000); surveyor.

HEMSWORTH.—Additions to Angel Inn, Ackworth, for N. L. Fernandes & Co.

HENLEY-ON-THAMES.—Sewage disposal scheme and furnaces for burning refuse, for the T.C. (£6,800).

HERNE BAY.—Alterations and additions to 86, High Street, for G. Wilkinson; J. Huxtable, architect, Station Road. Alterations to Dolphin Hotel; Saville and Martin, architects, Dacre House, Arundel Street Strand, London, W.C.

HIGH WYCOMBE.—Chair factory, Kitchener Road, for H. T. Dickens. Additions to printing works, High Street, for Butler & Son.

HOLYHEAD.—New Calvinistic Methodist Church at Towyn Chapel; R. Davies and Son, architects.

HORDEN.—New pit at Blackall Rocks, for the Horden Colliery Co.

HORSFORTH (near LEEDS).—Offices, house, &c., at Horsforth Mill, Woodside; J. H. Bakes, architect, Calverley Chambers, Victoria Square, Leeds.

ILFORD.—Emergency hospital (£5,000); R. Banks Martin, architect, East Ham.

IRLAM (LANCS.).—Sewerage works for the U.D.C.; Whittaker Bros., contractors, Flixton.

KENNETHMONT.—New hall; Thos. G. Archibald, architect, Huntley.

KENT.—County school for girls at Dartford; additions to county school at Sittingbourne (£400); additions to grammar school for boys at Maidstone (£600); elementary schools at Denton, Edenbridge and Sittingbourne; W. H. Robinson, architect, Caxton House, Westminster, S.W.

KINGSTHORPE (NORTHAMPTON).—New Baptist class-rooms and lecture hall; J. Ingman, architect, 33, Wood Street, Northampton; A. J. Chown, builder.

KINGSTON-ON-THAMES.—Chemical laboratory at the sewerage works, for the T.C.; borough surveyor.

LANCASTER.—Additions to Black Bull Hotel (£8,000); Harrison & Hall, architects, Church Street, Lancaster.

LEEDS.—Extensions to workhouse; G. F. Bowman, architect, 5, Greek Street, Leeds.

LEICESTER.—Proposed new Home for Consumptive Women; Saturday Hospital Society. New Primitive Methodist Church at Ratby.

(HUGGLESCOTE).—Proposed new Primitive Methodist Church at Wilkin's Lane.

LEIGH (LANCS.).—New St. Thomas's Church; Rev. J. T. Lawton, vicar.

Parish Church renovation (£6,000 or £7,000); Rev. Canon I. Smith, vicar.

LEY LAND.—Waterworks developments (£3,000 to £4,000); Surveyor, Council Offices, Leyland.

LISCARD (CHESHIRE).—Masonic Hall (£3,000); J. W. B. Harding, architect, 16, Cook Street, Liverpool.

LIVERPOOL.—Lift work and electric lighting at the new offices of the Royal Liver Friendly Society; W. A. Thomas, architect, 14, Dale Street, Liverpool.

LLANELLY.—Engine house and drying shed for the Blackthorne Brickworks Co.; Geo. F. Lambert & Sons, surveyors, Bridgend. New Y.M.C.A. buildings (£5,000).

LONDON (BRIXTON, S.W.).—Adaption of 54-56, Brixton Hill, for Girls' industrial school; T. J. Bailey, Education architect, Victoria Embankment, W.C.

(HACKNEY, N.E.).—Alterations and additions to 184, Stoke Newington High Street; Treacher & Son. Alterations and additions to 119 to 127, Kingsland High Street; Z. Dudley.

(LONG ACRE, W.C.).—Prospective restoration, after fire, of paper pattern factory in Langley Court.

(SOUTHWARK, S.E.).—Proposed extension of the Royal Eye Hospital; Dr. M. MacHardy. Re-erection of infants', boys', and girls' offices at Hatfield Street School; T. J. Bailey, Architect to L.C.C. Education Committee, Victoria Embankment, S.W.

(WOOLWICH, S.E.).—Addition to Sun Street Fire Station, for the L.C.C.

(BERMONDSEY, S.E.).—Building in Green Walk, for Sir W. P. Hartley, Tower Bridge Road, S.E. Building in Larnaca Street, for G. Potton & Son; J. M. Kennard, architect, 13, Railway Approach, London Bridge, S.E. Buildings in Tower Bridge Road; Thompson Bros.

(MARYLEBONE, W.).—Alterations, &c., at the Workhouse, Rackham Street; H. T. Dudman, Clerk to the Board of Guardians, Northumberland Street, Marylebone Road, W.

(N.E.).—Proposed hall (accommodate 200 rear of 258, Kingsland Road, for the Haggerston Conservative Club; Fredk. Wheeler, Son and Searle.

(W.).—Rebuilding 319, Oxford Street; E. Laurance & Sons, builders, Wharf Road, City Road, N. Extension to 4 and 4a, Orchard Street, for Lloyd & Co., drapers; T. Williams & Sons, builders, Richmond Street, Thornhill Square, N. Alterations to the electric lighting installation and new service lifts, at the Gambrinus Restaurant, Rupert Street; Emden, Egan & Co., architects, 2, Lancaster Place, Strand, W.C.

(ST. PANCRAS, N.W.).—Extensions at William Ellis School (£1,000); the Governors. Building in Tottenham Court Road, Whitfield Place and Warren Street; Seth-Smith & Monro, architects, 46, Lincoln's Inn Fields, W.C.

(MARYLEBONE, W.).—Additions to 46, Portman Square; Trollope & Colls, Ltd.

(NORWOOD, S.E.).—Buildings in New Park Road, Brixton Hill; H. Macintosh.

(DEPTFORD, S.E.).—Factory at Cold Blow Wharf, for the Key Glass Works, Ltd.; J. O. Cook.

(MILLWALL, E.).—Prospective rebuilding, after fire, of warehouses, for J. W. Cook & Co., Ltd., wharfingers, Manchester Road, E.

(EARLSFIELD, S.W.).—Probable re-construction, after fire, of factory, Ravensburg Road, for the British Incandescent Mantle Works, Ltd.

(LEWISHAM, S.E.).—Five houses, Thornwood Road; W. J. Scudamore and Sons, builders, 13, Manor Lane, S.E. Ten houses, Dukesthorpe Road; Edmondson's, Ltd., builders, 83, Sydenham Road, S.E. Probable reinstatement, after fire, of premises, 249a, Lewisham High Road, for Messrs. Squires, furnishers. Six houses, Eliot Park; J. Watt, builder, The Lodge, Bromley Road, S.E.

(HENDON, N.W.).—Adaptation of premises, Brent Street, for branch of London and Provincial Banking Co.; Head Offices, 3, Bank Buildings, Lothbury, E.C.

(WEST HAM, E.).—Quarters for the fire brigade; J. G. Marley, borough engineer. Adaptation of Swan depôt to skating rink for F. C. Bostock.

LONDON (STRATFORD, E.).—Alterations, Tillet's Essex steam laundry, 184, Romford Road. Additions and alterations, 20, Buxton Road; T. Booth, builder, 1, Aubrey Street, Field Road, Stratford, E. Workshop, rear of 50a, Romford Road, for G. A. Diggins. Additions and alterations, 370, High Street; A. J. Gale, architect, 4, Serjeant's Inn, E.C.

(CATFORD, S.E.).—Buildings, Bromley Road; Norfolk & Prior, architects, 4, Station Buildings, Catford Bridge, S.E.

(BARKING, E.).—Proposed extensions to hospital; consulting architect, Barking U.D.C.

MACCLESFIELD.—Proposed new bakery for the B.G.; Whittaker & Bradburn, architects.

MAIDSTONE.—Elementary school, Union Street, for the T.C.; T. F. Bunting, borough surveyor, Fair Meadow.

MANCHESTER.—Three new skating halls, Olympia, Ltd., Manchester. Proposed extensions at Chorlton Workhouse (£20,000); Chorlton Board of Guardians.

(BURNAGE).—New Congregational Church and conversion of present one into school; Rev. J. le Pla, pastor, Burnage.

(NEWTON HEATH).—New church of St. Wilfrid's.

MANGOTSFIELD.—Rebuilding the Lamb Inn; Paul & James, architects, Baldwin Street, Bristol.

MARKET HARBOROUGH.—Proposed new nursing home.

MERTHYR TYDFIL.—Extensions to Mardy Infectious Diseases Hospital, for the T.C. (£3,800). New chapel at Horeb, Penydarren; O. M. Roberts and Son, architects, 14, Bank Place, Portmadoc.

MITCHAM.—One hundred and eight houses and 14 shops, Oakwood and Ashtree Avenue, Lewis Road, for I. Wilson.

MORECAMBE.—Underground convenience (£2,250): J. W. Hepwood, architect, Town Hall, Morecambe.

MULLINGAR.—Prospective new County Hall.

NELSON.—General Gordon Inn to be rebuilt.

NEWCASTLE-ON-TYNE.—New Primitive Methodist hall and class rooms at Seaton Delaval (£900).

NORTHALLERTON (EAST COWTON).—New church.

NORTHAMPTON.—Probable reconstruction, after fire, of factory, St. George's Street, for Henry Marshall.

NORWICH (HETHERSETT).—New Primitive Methodist Chapel.

NOTTINGHAM.—New telephone exchange for H.M. Office of Works; Clerk of the Works, Head Post Office, Nottingham.

OSWESTRY.—New Welsh Calvinistic Methodist Chapel at Llanwddyn.

PAISLEY.—New spirit shop, store and office, Bridge Street and Cart Walk, for A. Faulds & Sons, Ltd.

PERTH.—Alterations on property, in High Street, for J. Mailer, fishmonger, St. John Street; new store and paint shop for Co-operative Society, John Clark, manager; alterations for J. Anderson, sports outfitter, St. John Street.

PINNER.—Alterations to Queen's Head, High Street, for T. Clutterbuck.

PLYMOUTH.—Church of St. Augustine; King & Lister, architects, 8, Princess Square; Pethick Bros., builders, Laird Bridge, Plymouth. Church of St. Symon; H. Reed, architect, Castle Street, Exeter; Pethick Bros., builders.

POLLOKSHIELDS.—Church of St. Gilbert (£9,000); Stewart & Patterson, Blythswood Street, Glasgow.

PONTARDAWE (GLAM.).—County higher elementary school (200 places); T. M. Franklen, clerk to the C.C., Cardiff.

PONTNEWYDD (near NEWPORT, MON.).—Business premises, hall, bakery, &c., for the Co-operative Society; A. E. Sheppard, architect, 89, High Street, Cardiff.

PONTYPRIDD.—Manual room and gymnasium at the Council school (£1,900); T. M. Franklen, clerk to the Glamorgan C.C., Cardiff. Twenty or more houses at Pwllgwaun; E. Rees, architect, Alexandra Chambers, Pontypridd.

PORTSMOUTH.—Rebuilding business premises, Commercial Road, for T. White & Co. (£3,314); Rake & Cogswell, architects, Prudential Buildings, Commercial Road, Landport; J. Croad, builder, Portland Street, Portsmouth. Proposed new licensed premises, junction of Farlington and Chichester Roads, for the Lion Brewery, Ltd.

PORT TALBOT.—Additions and alterations to Central school (£400) and extensions to Eastern Council School (£700); T. M. Franklen, clerk to the County Council, Cardiff.

PWLLHELI.—Fire station and stables; C. Roberts, Council officer, Pwllheli.

PYLE (near BRIDGEND).—New school (850 places) for Glamorgan C.C.; T. Mansel Franklen, clerk, Cardiff.

RAGLAN.—New vicarage for parish of Tregare; Ernest G. Davies, architect, 132, Widemarsh Street, Hereford.

RAMSGATE.—Probable re-erection of business premises, after fire, 139, Grange Road, for B. Newton, "Minerva," Southwood Road.

READING.—Adaptation of premises in Oxford Road, for Wesleyan Institute; Rev. H. Windross, 126, Oxford Road, Reading.

RICHMOND.—Extension of Town Hall; J. H. Brierley, borough surveyor, Richmond.

RICKMANSWORTH.—Swimming baths; A. E. W. Bone, builder. New Catholic Church, Park Road.

ROCHDALE.—Rebuilding St. Mary's Church.

ROTHERHAM.—Alterations and additions to premises, Greasbro' Road, for the T.C.; E. B. Martin, borough engineer.

RUGBY.—Restoration of portion of Stamford Hall, near Rugby, recently damaged by fire. Baths, for the U.D.C.; D. G. Macdonald, engineer and surveyor, Bern Buildings, Rugby. New premises for the Co-operative Society; Franklin & Newman, architects, Rugby.

RYE.—New Baptist Church (£2,400).

RYHOPE (DURHAM).—School; W. Rushworth, County Hall, Durham.

ST. ALBANS.—New Primitive Methodist Sunday Schools at Bernard's Heath.

ST. NEOTS.—Pumping station; J. Edey, St. Neots.

SALFORD.—Improvements in the electric lighting of the Technical Institute, for the Borough Education Committee (£400).

SANDFIELDS.—New school (£3,800); T. M. Franklen, clerk to the Glamorgan C.C., Cardiff.

SANDOWN.—Conversion of Wharncliffe College into officers' mess and quarters for officers of the Royal Garrison Artillery, for the Army Council.

SAXMUNDHAM.—Water and drainage schemes for the U.D.C. (£10,000); M. Richards, engineer.

SCISSETT (near HUDDERSFIELD).—Parish room; J. Kirk & Sons, architects, John William Street, Huddersfield.

SCORRIER (CORNWALL).—Additions to the Blackwater Council School; S. Hill, architect, Green Lanes, Redruth.

SHIFNAL (SALOP).—Primitive Methodist Church; E. Jones & Jackson, architects, 17, New Street, Wellington, Salop.

SHIPLEY.—Probable re-erection, after fire, of Airedale Tannery (damage, £6,000); Fredk. Holmes, Batley House, Baildon.

SHREWTON (WILTS.).—New manse in connection with the Baptist Church (£400 to £450); Rev. W. S. Wyle, pastor.

SOUTHAMPTON.—Suggested second asylum, for the Hants. County Council.

SOUTH SHIELDS.—Church (£3,500); H. Grieves, architect, South Shields. Stabling, store sheds, &c., at Station Road, for the Anglo-American Oil Co.; T. Rennoldson, architect, King Street, South Shields. Alterations to Union Flag public house, Thrift Street, for J. Rhagg; J. W. Wardle, architect, Fowler Street, South Shields. Alterations to Mariners' Arms public house, Market Place, for W. B. Reid & Co., Ltd.; J. M. Dingle, architect, Ocean Road, South Shields. Church building scheme for St. Oswin's Parish, Brinkburn.

SPENNYMOOR.—Sewerage and sewage disposal scheme, for the U.D.C. (£25,000); C. F. Murphy, Morpeth, engineer.

STALYBRIDGE.—Probable reinstatement of premises, after fire, for John Platt & Sons, furnishers, Back Castle Street.

STOKE-ON-TRENT.—Mortuary Chapel; the Governors, North Stafford Infirmary. Engineer's workshop, Booth Street; E. R. Hill. Two shops, Stoke Road; G. Rowe.

STONEHOUSE (near Plymouth).—Children's home and laundry, for the B.G.; D. Carwithen, builder.

STRABANE.—Manse at Donemanagh; W. Stuart, architect, Strabane.

SUNDERLAND (Roker).—Underground lavatories (£1,800); J. W. Moncar, borough engineer, Sunderland.

SUTTON (Surrey).—Residence, Worcester Road (£1,755); Chown & Sheffield, architect, 2, Princess Street, Hanover Square, W.; B. E. Nightingale, builder, Albert Embankment, S.E.

SWANSEA.—Extension of the Harbour Trustees fish market at South Dock.

TENTERBANK.—County school (£5,000); W. Hutchins, County Offices, Stafford.

THORNABY-ON-TEES.—Roller skating rink, Robert Street, for Chas. Bedworth, 6, High Street, Hanley.

THRYBERGH (Rotherham).—Working men's club (£2,000); P. A. Hinchliffe, architect, 14, Regent Street, Barnsley; W. M. Beeden, builder, Thrybergh, Rotherham.

TODMORDEN.—Rubber works extensions at Cinderhill Mill; Hallas & Co.

TONBRIDGE.—Alterations and extensions to the workhouse, Pembury, for the Board of Guardians; S. Philpott, architect, 65, High Street, Tonbridge Wells. Weights and Measures office, for Kent C.C.

TONGWYNLAIS.—Additions and alterations to school; T. M. Franklen, clerk to the Glamorgan C.C., Cardiff.

TORPOINT.—New county school; Mr. Andrew, county architect, Truro.

TOTNES.—Town Hall Buildings; H. Tollitt, architect, High Street, Totnes.

TREDEGAR.—New Vicarage for St. James's Parish; A. F. Webb, architect, Blackwood, Mon.

TYDERWEN.—New school (£4,300); T. M. Franklen, Clerk to the Glamorgan C.C., Cardiff.

WALKDEN.—New workshops and contractors' depôt off Kay Street; J. Harrop, Walkden Road, Walkden.

WALSALL.—Probable reinstatement, after fire, of premises, Freer Street, for Vale & Bradnack, brush manufacturers.

WALTON-ON-THE-NAZE.—Home, Naze Park Road; H. W. Gladwell, builder, Walton.

WATFORD.—Additions to printing works, Jubilee Road, for Stone & Cox.

WEXFORD.—Old Budewell to be converted into inebriates' home; D. Turner, architect, Upper Rathmines, Dublin.

WEYMOUTH.—Skating rink; J. Roberts, Jubilee Hall, St. Thomas Street, Weymouth.

WHITBY.—Alterations and additions (including billiard room) at Belle Hotel; A. E. Young, architect, Whitby.

WHITLAND (Carmarthenshire).—Rebuilding and enlargement of Bethlehem Congregational Church.

WIDNES.—Additions to co-operative warehouses (£7,000); Mr. Jones, Bank Chambers, Runcorn.

WIGTON (Cumberland).—Conversion of premises into public offices for the R.D.C. (£1,000); Mr. Ritson, clerk.

WINSFORD (Cheshire).—C.E. Day Schools in Gladstone Street, Over (£4,000); J. and W. Wilding, architects, Runcorn.

WOLVERHAMPTON.—Extensions of baths for the T.C. (£10,200).

WOMBWELL (Yorks).—Nine houses, Hemingfield, for Adam Taylor; six houses, Mitchell's Terrace; John Robinson, architect, Park Cottage, Wombwell.

WORSBRO' (near Barnsley).—Working men's club and institute at Birdwell.

YORK.—Alterations to the New Street Dispensary; T. Monkman, architect, St. Martin's House, Micklegate, York. Completion of the renovation of St. William's College.

CONTRACTS OPEN and CLOSED.

OPEN.

Abertillery.—February 26th. Two 66-kw. vertical gas engines and dynamos, suction gas plant, balancer, booster, pipework, switchboard, poles and overhead conductors, cables, feeder and other pillars, and public lighting apparatus, for the U.D.C. See "Official Notices" February 12th.

Ashton-under-Lyne.—March 3rd. Water-tube boiler and engine-driven induced draught fan for the Electricity Department. See "Official Notices" February 12th.

Austria.—Tyrol.—March 20th. The villages of Rian, Judenstein and Tulfes are to be supplied with electric light. Particulars may be obtained from the Gemeinde-Vorstcher, at Rian.

Australia.—Melbourne.—Two multiple magneto switchboards for the incoming junction lines to the P.M.G.'s department in N.S.W. See "Official Notices" February 19th.

Barking.—Electric fire-alarm gongs on the wet battery system are to be fitted at the Church of England schools by way of experiment.

Belfast.—March 8th. Tramway stores for the Corporation. See "Official Notices" February 19th.

March 15th.—Stores for the electricity department. See "Official Notices" to-day.

Belgium.—March 8th. The Société Nationale des Chemins de fer Vicinaux, 14, Rue de Science, Brussels, is inviting tenders for the overhead electrical equipment of the Spa-Sart section of the Spa-Verviers electric railway.

Brussels.—March 10th. Numerous appliances and usual material required for the electric lighting of the trains of the Belgian State Railways. A special specification, No. 681, is available at 15, Rue des Augustins, or from M. de Rudder, 11, Rue de Louvain.

Bolton.—March 1st. Stores for the Tramways Department. See "Official Notices" February 12th.

Brighouse.—March 2nd. Balancing set, feeder cables, switchboard, &c., for the Corporation. See "Official Notices" February 12th.

East Cowes (I. of W.).—February 27th. 30-h.p. motor, with all transmission gear, capable of running pumps at waterworks, for the U.D.C. Albert Barton, Surveyor to the Council.

Elham.—March 11th. The lighting of the workhouse at Lyminge, near Folkestone. See "Official Notices" February 12th.

Esher.—March 3rd. Wiring for electric light at the sewage disposal works, Lower Green, for the U.D.C.; the surveyor.

Germany.—Tenders are shortly to be invited by the municipal authorities of Meezen for the establishment of a central electric lighting station in the town.

Gravesend.—March 1st. Cable troughing, meter boards, incandescent lamps, meters, &c., for a year. Electricity Works.

Heston and Isleworth.—March 3rd. Sundry cables and electrical supplies for the U.D.C. See "Official Notices" February 19th.

Hornsey.—March 8th. Meters, cables, troughings, &c., for the T.C. See "Official Notices" February 12th.

Ilkley.—Mechanical stoking machinery for the U.D.C. (£5,700).

Italy.—Rome.—March 22nd. Electric lamps and brackets, estimated to cost £6,000, are required for the Naples and Spezia Arsenals. Application must be made to the Ministero della Marina, preferably through a local agent.

Naples.—March 20th. The commander of the Royal Arsenal requires tenders for electric ship lamps, estimated to cost £1,600.

London.—Tenders are being invited for the supply of a complete plant for the production of electrical cables of every description. See an "Official Notice" February 19th.

Battersea.—March 2nd. Materials for the B.C. Electricity Department. See "Official Notices" February 12th.

L.C.C.—March 9th. Two 1,500-kw. rotary converters and six 575-kw. single-phase transformers for the Elephant and Castle tramways sub-station; switchgear; electric light wiring for Norwood tramways car-shed. See "Official Notices" February 12th.

Fulham.—March 3rd. General and electrical stores for the B.C. See "Official Notices" February 19th.

Westminster.—February 26th. Combined high and low-tension switchboards; low-tension d.c. switchboard and battery boosters for the Westminster Electric Supply Corporation, Ltd., at Horseferry Road station. See "Official Notices" February 12th.

Newport (Mon.).—March 2nd. Electric light fittings for the Board of Guardians. Ithel Thomas, Clerk, Queen's Hill, Newport (Mon.).

Radcliffe.—March 2nd. 300-kw. steam dynamo, 100-kw. motor-generator, booster, condensing plant, piping and switchboard extensions for the U.D.C. See "Official Notices" February 12th.

March 2nd.—Lancashire boiler and superheater, and feeder cable for the U.D.C. electricity works extensions.

Rochdale.—March 17th. Water treatment plant for the Electricity Committee. See "Official Notices" to-day.

Russia.—March 14th. The municipal authorities of Rian are open to receive tenders for the concession for the installation and working of private and street lighting, a small generating station, power supply to the tramways, &c.

Salford.—March 1st. Sinking a bore-hole and supply of pumping plant for the Electricity Committee. See "Official Notices" February 19th.

Stockport.—March 1st. New distributing mains at Stepping Hill Hospital, for the Guardians. See "Official Notices" February 12th.

Tipperary.—March 13th. Lighting the Union Workhouse premises from an electric or other installation. See "Official Notices" to-day.

Turkey.—MARIKÖI.—Powder factory belonging to the Turkish Government. Tenders for a 19-H.P. steam engine to drive a dynamo. Particulars may be obtained by sending a return stamp to the Conseil d'Administration de la Grande Maitrisa d'Artillerie.

Wimbledon.—March 4th. Stores, &c., for the Corporation electricity department. See "Official Notices" February 12th.

Wrexham.—March 13th. Materials for the Corporation electrical department. See "Official Notices" February 19th.

CLOSED.

Aldershot.—The U.D.C. has accepted the tender of Messrs. Richard Hornsby & Sons for an 11-B.H.P. gas engine and dynamo for the Sewage Works, at £118.

Barking.—The District Council has accepted the tender of the Western Electric Co., Ltd., for feeder cable, at £46. Six tenders were received, ranging from that stated to £57.

Dundee.—The tender of Messrs. G. Massiot Browne and Co., Glasgow, £233, has been accepted for the supply of carbons to the electricity department. A contract, £133, has been entered into with Messrs. Siemens Bros. & Co., Ltd., for switchgear in the sub-stations.

Glasgow.—The T.C. Sub-Committee on Works have recommended acceptance of the following:—

Spares, Rutherglen sub-station electrical equipment.—British Westinghouse Co.
Single-stroke bells.—Standard Electric Co.
Granite setts, 15,000 tons.—Welsh Granite Co.

Lowestoft.—The accepted tender of Messrs. Venner and Co., mentioned in our issue of the 12th inst., was for two-wire meters, not three-wire.

London.—HAMMERSMITH.—At the specially called Council meeting held yesterday the Electricity and Lighting Committee reported on the turbine and other tenders. They stated that they had considered the following tenders for supplying the 2,000 KW. turbo-alternator, part of the complete set, consisting of turbo-alternator, motor-driven exciter, and condensing plant:—

Name.	Delivery.	
*Richardsons, Westgarth	5½ months	£5,470
*Parsons & Co.	7 "	5,473
*Siemens Bros.	7 "	5,478
Richardsons, Westgarth & Co.	5½ " (recommended)	5,613
*Belliss & Morcom, Ltd.	6 "	5,616
Brush Electrical Engineering Co.	5½ "	5,695
*Fraser & Chalmers	8 "	5,880
British Thomson-Houston Co.	7 "	5,900
*General Electric Co.	8 "	5,980
British Westinghouse	9 "	6,060
*Electric Cons. Co.	8 "	6,400
*J. Howden & Co.	6½ "	6,491
*Vickers, Sons & Maxim	5½ "	6,722
*John Musgrave & Co., Ltd.	8 "	6,805
Maschinen Fabrik Oerlikon	4 "	6,995
Lahmeyer Electrical Co.	Not stated	7,091
Willans & Robinson	6 months	7,220

* These firms submitted several alternative prices, but the lowest in each case only has been inserted.

"The specified time for the complete delivery of the plant is July 31st, 1909, and it is of the utmost importance that the contractor should be able to carry out the contract as far as possible by that time. Having regard to this condition, and also the specified maximum output required, viz., 2,000 KW. with an overload capacity of 20 per cent., we have, after giving each tender most careful consideration, come to the conclusion that the machine proposed to be supplied by Messrs. Richardsons, Westgarth & Co. for £5,470 is too small for the requirements, and that the final selection lay between the tender of Messrs. Richardsons, Westgarth & Co. of £5,613, and that of the Brush Electrical Engineering Co. of £5,695, both of which machines appear to be equally satisfactory. The average steam consumption per KW.-hour of the former machine is 16·27, and of the latter machine 16·28. In considering what machine to recommend to the Council, we have taken into account that Messrs. Richardsons, Westgarth & Co. are unable to promise delivery before August 5th, being a week later than the specified time. On the other hand, their tender is £82 less than that of the Brush Electrical Engineering Co., and a similar machine supplied and erected by Messrs. Richardsons, Westgarth & Co. for the Council on a previous occasion has worked to the Council's complete satisfaction. In these circumstances we recommend that the tender of Messrs. Richardsons, Westgarth & Co., of Hartlepool, in the sum of £5,613, be accepted."

Motor-driven Exciter.—The following tenders were received for the exciting plant:—

General Electric Co. (recommended)	£218
Electric Construction Co.	240
Parsons & Co.	252
British Thomson-Houston Co.	288
Siemens Bros.	310
Brush Electrical Engineering Co.	317
British Westinghouse Co.	346
Maschinen Fabrik Oerlikon	370
Brown, Boveri & Co.	397
Vickers, Sons & Maxim	397
Dick, Kerr & Co.	400
Lahmeyer Electrical Co.	417

Condensing Plant.—The following tenders were received for the supply and erection of condensing plant:—

Willans & Robinson (vacuum augmenter) (recommended*)	£1,173
Fraser & Chalmers	1,335
Cole, Marchent & Co. (per B.T.-H.)	1,365
Brush Electrical Engineering Co.	1,378
Worthington Pump Co. (per B.T.-H.)	1,430
Allen & Son (per B.T.-H.)	1,550
Belliss & Morcom, Ltd.	1,598
Midland Engineering Co.	1,601
Willans & Robinson (Contraflo)	1,617
Mirrlees Watson & Co.	1,705
Lebanc (per British Westinghouse)	1,720
Parsons & Co.	1,846
Richardsons, Westgarth & Co.	1,880
J. Musgrave & Son, Ltd.	2,014

* Subject to satisfactory guarantees for the efficient working to Council's requirements.

HACKNEY.—The E.L. Committee has reported fully upon the tenders received from eleven firms for electricity meters. The prices offered by Messrs. Chamberlain & Hookham and Messrs. Ferranti, Ltd., were identical, and their tenders are recommended for acceptance, each firm, as far as practicable, to be given an equal proportion of the orders.

MARYLEBONE.—The B.C. has received the following tenders for house-service boxes required in connection with the conversion from gas to electric lighting in the streets:—

Callender's Cable Co., Ltd., No. 1, 6s. 4d.; No. 2, 7s. 3d.: No. 3, 7s.; No. 4, 7s. 9d. each.
Johnson & Phillips, Ltd., fittings for No. 1, 1s. each; twin ditto, 10d. each.
British Insulated and Helsby Cables, Ltd., twin fittings for No. 2, 1s. 1½d. each.
Sykes & Sugden, Ltd., fittings for Nos. 2 and 3, 1s. 9d. each; No. 4, 1s. 11d. each.

ST. PANCRAS.—The B.C. received the following tenders for the supply of a motor-generator for mains testing:—

British Thomson-Houston Co., Ltd. (including field rheostat) (accepted)	£52
Crompton & Co., Ltd. (including field rheostat)	61
Lahmeyer Electrical Co., Ltd. (including switchgear)	165

WANDSWORTH.—The following tenders were received by the B.C. for the electric light installation at the Putney Library:—

Dennison, Fillem & Co. (accepted)	£96
Grosvenor Electrical Co.	126
H. Dakin & Co.	126

Wigan.—The Corporation electricity department has accepted the following tenders for materials for this year:—

Electrical accessories.—General Electric Co., E.M.F. Manufacturing Co. and Dorman & Smith.
Iron castings.—John Wood & Sons, Tickle Bros., Malleable Steel Castings Co. and Roger Bolton.
Iron and steel.—Thompson & Co.
Lamps.—(English) General Electric Co., and (traction) Universal Mill Furnishing Co.
Cable.—Paper-insulated, W. T. Glover & Co.; rubber-insulated, workshop flexible, cotton-covered flexible, silk-covered flexible, British Insulated and Helsby Co.; rubber-insulated and lead-covered, armature wire, telephone wire and armature binding wire, and three-core rubber telephone cable, W. T. Glover & Co.

Tenders for tramway requirements were accepted as follows:—

Brass and iron castings.—John Wood & Sons, Tickle Bros., Malleable Steel Castings Co., Roger Bolton & Son, and Pepper Mill Co.
Iron and steel.—Thompson & Co.
Timber.—Johnson & Son.
Tramcar accessories.—Dick, Kerr & Co., Manchester Armature Repairing Co., P. R. Jackson & Co., British Westinghouse Co., Imeson Bros., Finch & Co., Malleable Steel Castings Co., J. Baker & Co., P. Clark and Co., Watlington & Co., British Insulated Co., Fleming, Birkby and Goodall, Hurst, Nelson & Co., Ashton Engineering Co., Gabriel & Co., Lion Spring Co., Macintosh & Co., British Thomson-Houston Co., Universal Mill Furnishing Co., Roger Bolton & Son, Young & Co., Percy Clark & Co., R. Burland & Sons, and R. Jolley.
Overhead material.—British Insulated Co. and Watlington & Co., General Electric Co. and Watlington & Co.
Paint and varnish.—Joseph Mason & Co., R. Burland & Sons, and Gaskell and Son.

York.—The D.P. Battery Co., Ltd., have received an order from Messrs. Rowntree & Co. to install in their large cocoa works at York one of their L.S.H. type batteries with a capacity of 323,000 watt-hours, also an automatic reversible booster and switchboard to deal with the fluctuations of the load. A special feature of this installation consists of two inter-connected stations, 330 yards apart, one gas and the other steam-driven. The battery will be at the former station, which will supply a portion of the load at the latter station, but occasionally the inter-connecting cable will be reversed and the steam set will assist the gas station.

France.—La Compagnie Française Thomson-Houston has acquired the undertakings of the Société d'Electricité Thomson-Houston de la Mediterranée and the Compagnie des Accumulateurs Union.

FORTHCOMING EVENTS.

Northampton Institute Engineering Society.—Friday, February 26th. Paper on "Water Rheostats," by Mr. C. W. Goodram.

Saturday, February 27th.—At 7.30 p.m. At Stone's Restaurant, Ludgate Broadway, E.C. Smoking Concert of past and present Day Students. All old Day Students of the Institute invited. A provisional committee will be selected for the proposed Past Students' Association.

Saturday, March 6th.—Visit to the National Physical Laboratory.

Physical Society.—Friday, February 26th. At 5 p.m. At the Finsbury Technical College. Paper on "The Self-Demagnetising Factor of Bar Magnets," by Prof. S. P. Thompson and Mr. E. W. Moss; exhibition of optical properties of combinations of mica and selenite films in convergent polarised light, by Prof. S. P. Thompson; and exhibition of electrical and other apparatus, by Mr. C. R. Darling.

Institution of Civil Engineers.—Friday, February 26th.—At 8 p.m. Students' Lecture on "Standardisation in Engineering Practice," by Dr. W. C. Unwin.

Institution of Electrical Engineers (Manchester Section).—Friday, February 26th. Annual dinner.

Association of Engineers-in-Charge.—Saturday, February 27th.—At 3 p.m. Visit to the L.C.C. Generating Station, Greenwich.

Liverpool and District Electrical Association.—Saturday, February 27th. At 3 p.m. Visit to the General Post Office, Victoria Street, Liverpool.

Tuesday, March 2nd.—At 8 p.m. At the Common Hall, Hackins Hey, Liverpool. Discussson on "Motor Starters for Direct Current," introduced by Mr. J. Greenhalgh.

Institution of Electrical Engineers (Newcastle Section).—Monday, March 1st. At 8 p.m. At the Armstrong College, Newcastle. Paper on the "The Electrical Equipment of Modern Battleships," by Mr. A. P. Chalkley.

Royal Society of Arts.—Monday, March 1st. At 8 p.m. Cantor Lecture on "Modern Methods of Artificial Illumination," by Mr. Leon Gaster. (Lecture III.)

Faraday Society.—Tuesday, March 2nd. At 8 p.m. At the Library of the I.E.E. Papers on "The Rate of Evolution of Gases from Homogeneous Liquids," by Messrs. V. H. Veley and J. C. Cain; "The Electro-Analysis of Mercury Compounds with a Gold Cathode," by Mr. F. Mollwo Perkin; and "The Relation Between Composition and Conductivity in Solutions of Meta- and Ortho-Phosphoric Acids," by Mr. E. B. R. Prideaux.

Institution of Electrical Engineers, Manchester (Student's' Section).—Tuesday, March 2nd. At 7.30 p.m. At the Municipal School of Technology, Manchester. Paper on "The Design of Small D.C. Machines," by Messrs. B. E. Stott and J. Hargrove.

Saturday, March 6th.—Visit to the Electrical Installation of the Collins Green Colliery Co., Ltd., Earlstown.

Institution of Electrical Engineers (Leeds Section).—Wednesday, March 3rd. At 7.15 p.m. At the University, Sheffield. Paper on "Researches on the Magnetic Properties of a Series of Carbon Tungsten Steels," by Mr. T. Swinden.

Institution of Electrical Engineers (Students).—Wednesday, March 3rd. At 7.45 p.m. Meeting at the Library of the Institution. Paper on "Rheostats," by Mr. J. S. Messent.

Civil and Mechanical Engineers' Society.—Thursday, March 4th. At 8 p.m. At Caxton Hall, Westminster. Paper on "Some Commercial Aspects of the Management of Central Electricity Supply Stations," by Mr. R. Borlase Matthews.

Rontgen Society.—Thursday, March 4th. At 8.15 p.m. At 20, Hanover Square, W. Paper on "Some Vacuum Tube Phenomena," by Mr. A. A. Campbell Swinton.

Royal Institution.—Saturday, March 6th. At 3 p.m. Lecture on "Properties of Matter," by Prof. J. J. Thomson. (Lecture II.)

THE ELECTRICAL ENGINEERS
(LONDON DIVISION).

The following orders are issued:—

Commanding Officer—Col. R. E. B. Crompton, C.B.

Monday, March 1st.—"A" Company. Infantry drill (recruits), 6 to 7 p.m. Technical drill, 7 to 10 p.m.

Tuesday, March 2nd.—"B" Company. Infantry drill (recruits), 7 to 7.45 p.m. Technical drill, 7 to 9.30 p.m.

Thursday, March 4th.—"C" Company. Infantry drill (recruits), 6 to 7 p.m. Technical drill, 7 to 10 p.m.

Friday, March 5th.—"D" Company. Infantry drill (recruits), 6 to 7 p.m. Technical drill, 7.15 to 9.30 p.m.

(Signed) J. H. S. Phillips,
Capt. and Acting Adjutant.

NOTES.

Interference of Wireless.—Telephone men in some quarters, says *Telephony*, seem to think that the wireless telephone is at some date to become a competitor. Whether this be due to the reckless statements of a group of agents for a certain wireless telephone stock, whose methods would put any wildcat mine promoter completely in the shade, or to lack of scientific knowledge, is hard to tell. But the reason why the wireless telephone can never be used in exchange work, or to replace any network of lines, is made clear by the following record from the Marconi wireless telegraph station at Siasconset, Mass., at the time the passengers of the *Republic* were saved, largely as a result of the good work of the wireless when free from interruption.

The log begins at ten minutes before the first dim flash "CQD," which in the language of the wireless means, "All ships hasten to aid distressed boat." The record says:

"6.40—Hear MKC calling CQD (MKC means the *Republic*). I sent back SS (Siasconset). He said he had been run down and was sinking rapidly. 'Send help quickly,' he repeated three times.

"I got busy at once, raised operator at Wood's Hole, told her to rush revenue cutter; she did it. Then I began to call CQD getting LC (*La Lorraine*); told him of disaster; said he would speed to rescue. Then got BC (*Baltic*); he is doing the same.

"8.04—Received MSG (captain's message) from MKC (*Republic*), saying he was rammed by unknown ship and was sinking 25 miles south of Nantucket. No lives lost and not in danger.

"8.30 a.m.—Hear MKC answer BC, but RCG (revenue cutter *Gresham*), using stronger current, drowns everybody.

"8.45 a.m.—Had MKC; tell MKC that BC and LC are rushing to her aid.

"Binns answered: 'Good! Tell them to hurry!'

"9.15 a.m.—LC (*La Lorraine*) says our boilers are nearly bursting.

"9.15 a.m.—MKC reports passengers O. K. on board steamship *Florida*.

"9.15 a.m.—Revenue cutters and navy stations are 'jamming thick.' ('Jamming' in the telegraphers' vernacular means the diffusion of several strong currents which prevents a clear message by anybody.)

"9.47 a.m.—MKC says to listen for rockets.

"10.12 a.m.—Can't make out jammed messages.

"10.50 a.m.—Navy won't keep out.

"11.05 a.m.—Tell revenue cutters to cut out and lay by.

"11.30 a.m.—BC (Portsmouth) and RCD talking and jamming us right and left.

"11.40 a.m.—Navy insists on jamming. I gave them BY again (meaning keeping quiet).

"1.32 a.m.—Have found the LA (*Lucania*).

"2.05—BC, LC and LA scouting for signs of MKC. *Florida* has no wireless.

"2.30—BC asks CQ (all stations) to keep out for God's sake."

The above gives no reason to decry the wireless in its proper field. But it clearly shows that neither the wireless telegraph nor telephone is adapted to carrying on a busy inland traffic. We are doing pretty well, says our contemporary, when we make one pair of wires aid in the simultaneous transmission of three messages without interference. Using the air for a conductor, and transmitting hundreds at once, there would be simply hopeless confusion.

Russian Platinum Monopoly.—The majority of the platinum producers in the Ural have for a number of years past been bound, according to the St. Petersburg correspondent of the Berlin *Tageblatt*, by a contract which has placed upon them the obligation to deliver the whole of their output to an English firm. But as the latter paid a lower price than the French firm of Bonardelle, with whom the remaining Ural producers were already working, the majority have now resolved to pay the indemnity provided for in the contract, and, the correspondent states, to dissolve the business connection with the English firm. All the producers in the Ural are forming jointly with the French firm in question a company for the working of the Tagilsk mines, the French firm taking over shares to the extent of 6,000,000 roubles (£600,000). In this way the producers seem to have overcome the difficulty respecting working capital, which they have lacked for a long time. The condition of the miners, who have been compelled to work at very unfavourable rates of wages, is to be improved. The minimum price for platinum has been fixed at 28,000 roubles per pood, or considerably higher than at present. It is added that the question of establishing a monopoly in platinum has again been raised, and a conference is about to be held at St. Petersburg under the presidency of an official of the Ministry of Commerce, for the purpose of regulating the trade in the metal.

An article in the *Chemical Trade Journal* gives some interesting information on the recent situation in the platinum market. It appears that, in 1907, when the price of platinum was low, a foreign syndicate commenced to buy up the smaller platinum concerns in Russia, and entered into an advantageous contract with the largest, the Tugil and Schouvaloff houses. This syndicate (not named) has since gradually acquired control of the whole Russian market, and the smaller producers find themselves obliged to sell their concerns to it at practically any price. This has resulted in an agreement amongst the producers, who are now endeavouring to get the Government to regulate the industry, either by making it a Government monopoly, or by authorising the Imperial Bank to lend money on the precious metal at a fixed rate, and requiring the metal to be refined in this country. This the foreigners are trying to combat by allowing the price of platinum to rise, diminishing their profits for a time, but benefiting the producer.

The Electro-Metallurgical Industry in Germany.—According to a trade correspondent of a German newspaper the electro-metallurgical industry appears to be approaching a crisis, the works concerned in the first place being those producing aluminium, carbide of calcium, and alloys of iron, copper, &c., with other metals, as, for instance, ferro-silicon, ferro-chromium, &c. As far as aluminium comes into question the severe competition continues, notwithstanding statements to the contrary, as no improvement in prices has been perceived in the "great neutral market," which is the term applied to Germany, where the price is not materially higher than £3 per cwt., free at station of consumption. This price is surprising if credence is attached to the statements of the old and formerly syndicated works to the effect that at this price they suffered a serious loss as compared with the

cost of production. The old works, on the dissolution of the syndicate, almost generally turned their attention to the utilisation of the surplus power by preparing to produce other articles, as, for example, carbide of calcium, or metal alloys, or by the fixation of nitrogen. At present the market for carbide is very unfavourable, and it seems as if the price has receded owing to over-production. At any rate, many low offers are now on the market. The artificial manure to be obtained electro-chemically has not yet appeared on the market. The winning of atmospheric nitrogen is of all things dependent upon the employment of powerful waterfalls, and consequently upon the possession of considerable capital. In any case the Baden Aniline and Soda Co., of Ludwigshafen, has assured itself of a considerable advantage over forthcoming competitors by its undertakings in Norway. In the case of iron alloys the decline in the output of iron and steel in 1908 also appears to have called forth over-production of the former. The price of ferro-silicon, for instance, which still stood at from 19s. to 20s. per cwt., free at German stations, in 1907, now ranges from 11s. 9d. to 12s. 3d. per cwt. The condition of the electro-chemical and metallurgical industry suggested that when a superabundance of one article exists, the works partly changed over to the output of another product that was still profitable, and the repetition of the process, combined with the extension of plant in recent years, has brought about over-production and depression in the market.

Wireless Torpedo.—We are threatened with another wireless torpedo, invented by Monsieur Gustave Gabet, a French engineer, and it is said that he can control it from a distance so as to make it turn in any required direction by means of radio-telegraphic signals. This is all very well, we do not dispute the practicability of being able to direct such an engine of warfare by means of radio-energy. What we do not understand is how Mons. Gabet proposes to get over the fact that all battleships nowadays are capable of radiating very large amounts of energy especially in their immediate vicinity. We should like to know what Mons. Gabet's torpedo is going to do when it receives contradictory orders from the enemy. We can imagine that an exhibition of its intelligence would be highly entertaining when fired at a fleet of battleships all frantically endeavouring to persuade it to turn its nose in the opposite direction.

Doubtless the code to which the torpedo responds is a dark secret, but there is probably only one signal which it will recognise as "go full speed ahead," and so long as this order can be countermanded by any other signal, one may be pretty sure that the fact would reveal itself on its maiden voyage.

Of course a round half dozen bewildered torpedoes frantically rushing hither and thither would be highly embarrassing to both parties, but it is probable that the terrific fusillade of wireless abuse going at full power in the neighbourhood of the fleet would return the torpedo to its friends in a sadder and wiser frame of mind.

Dockyard Lighting.—The result of the vote which, at the instance of the Admiralty, was taken at the Royal Dockyards in connection with the re-arrangement of working hours during the winter, was that an overwhelming majority of the men voted in favour of the present system being continued. The existing arrangement necessitates the use of electric light for about an hour and a half daily, and it is the saving of the expense in this direction which is under consideration, and which may result in the present working hours undergoing some modification.

Electricity in Agriculture.—The Berlin correspondent of the *Standard* says that the former Prussian Minister of Agriculture, Lieut.-General von Podbielski, a close personal friend of the Emperor, has accepted a salaried post as agent of the General Electricity Co. "His duties will consist of organising and conducting a propaganda in favour of the application of electricity to all branches of agriculture. The company desires to bring about the general introduction of electric ploughs and reaping, sowing and threshing machines, as well as to persuade farmers to use electric light in their buildings."

Tramway Socials.—The annual dance promoted by the South Lancashire Tramways Co. took place on Wednesday night, last week, at the Leigh Co-operative Hall under the patronage of the Hon. Arthur Stanley, M.P., and Mr. J. R. Salter, general manager of the company. There were over 300 persons present.

Between 300 and 400 employés and friends of the Blackpool Tramways held their annual gathering and dance on Monday evening last week in the Victoria Hall of the Winter Gardens.

Mr. T. B. Goodyer (general manager) recently presided at the annual dinner of the Croydon Tramways Athletic Club. Those present included the Mayor of Croydon (Major J. E. Fox), Sir Frederick T. Edridge and Alderman J. Trumble (Chairman of the Tramways Committee). The chairman reviewed the athletic events of the year, mentioning that there was a profit of £15 on the last sports, of which £5 5s. was sent to the Croydon General Hospital. The year closed with a satisfactory balance in hand. The Mayor distributed the prizes, and gave a number of interesting statistics. He pointed out that electric traction was practically begun in Croydon in 1902. Since then they had taken £477,771 in fares, and had carried 104,781,687 passengers, while the cars had run 11,986,619 miles. To Mr. G. C. Foster (superintendent), the hon. general secretary of the club, a gladstone bag was presented. Whips were presented to two local draymen, suitably inscribed, for their good disposition towards motor-men when on the road, in immediately pulling clear when required.

At the annual supper of the employés of the Merthyr Electric Traction and Lighting Co., Ltd., on Saturday night, a presentation was made to Inspector Gwyn on the occasion of his marriage. Mr. Lewis W. Dixon, the managing engineer, in the course of the evening announced that after nine years of struggle the company was beginning to do much better, and predicted greater developments before many years had passed.

London Chamber of Commerce (Electrical Section).—A meeting of the above Section was held on Tuesday, last week, at the offices of the Chamber in Oxford Court. Mr. C. P. Sparks was re-elected chairman, and Mr. W. L. Madgen and Mr. C. H. W. Biggs as deputy-chairmen. The Section considered the revised regulations issued by the Home Office relating to the generation, transformation, distribution and use of electricity in factories. The chairman presented a report with regard to alterations made in the regulations as compared with the original draft proposed by the Home Office, calling particular attention to the cases where the Home Office had not given effect to the recommendations of the commissioner appointed to hold the inquiry. The Section approved of a communication addressed to the Home Office asking it to receive a deputation in order that those interested might have an opportunity of placing their views before the Home Office. The Section also considered proposals with regard to co-operation on matters of common interest between various electrical institutions and associations, the London County Council (General Powers) Bill, and the petition which had been deposited by the London Chamber of Commerce against the Great Northern, Great Central, and Great Eastern Railway Co.'s Amalgamation Bill.

A Central Station Engineers' Holidays.—In strange contrast to the attitude of the Stafford Councillor, who asked if the services of the engineer could not be dispensed with, is the attitude adopted by the councillors of the Scottish burgh of Falkirk. So convinced are they of the importance of the duties their electrical chief performs that they cannot do without him for more than a fortnight in each year. In other words, they have reduced the engineer's holidays to this period. Last Monday there was a lively debate on the matter. One councillor wanted the electrical engineer to get three weeks' holidays, remarking that he was almost continually at work night and day, being frequently rung up on the telephone. An allegation of cheese-paring drew from a ministerial member the retort that if there was one department that required strict and continual attention it was the electrical department. To this he added that if they could do without the head of that department for three or four weeks they could do without him a good while longer. It was also the opinion of the Town Treasurer that any concern that could give a manager three weeks' holidays did not require a manager at all. Then the momentous question was settled by a vote, when it was agreed that the engineer's holidays should extend to a fortnight only.

Opposition to Private Bills.—Our Parliamentary correspondent states that over 500 petitions have been deposited in the Private Bill Office against the private Bills which will this session originate in the House of Commons, and against some which will originate in the Lords. Many of the electric tramway and power proposals are in the opposed list.

Annual Dinners.—I.E.E. Leeds Local Section.—The annual dinner of the Leeds Local Section of the I.E.E. was held at the Hotel Metropole, Leeds, on Friday evening last.

Mr. H. E. Yerbury, of Sheffield, chairman of the Local Section, presided, and those present included Ald. E. Matheson (Leeds), Councillors R. A. Smithson and W. C. Fenton, Mr. W. M. Mordey (president of the Institution), Lieut.-Col. Lister (Birmingham) and many well-known members of the Institution. The company numbered about 100.

Mr. Robert Hammond, in proposing "The Corporation of Leeds," referred in complimentary terms to the management of the City's undertakings. Alluding to the fact that last year every single item of surplus in the Corporation's trading concerns was transferred to the City funds for the relief of the rates, he remarked that it was prudent to lay something by for the rainy day.

Mr. R. A. Smithson (chairman of the Leeds Tramways and Electricity Committee) replied to Mr. Hammond's mild criticism. It was true, he said, that last year they cleared out the last of the reserves, and started on a straight edge, as it were, but he thought it was reasonable and fair that they should do so. They were in a very much safer position than 10 or 12 years ago, when they were not quite sure how the concerns were going to turn out. They now knew the actual life of every part of their undertaking, and, therefore, had no necessity for large reserves. The ratepayers, he said, were in the position of shareholders, and were entitled to some little return on the capital they had laid down. They claimed they had provided for every reasonable depreciation and risk, and repairs and renewals were made out of revenue before a penny was handed over to the rates.

Alderman E. Matheson (Leeds) proposed "The Institution of Electrical Engineers," and gave an interesting sketch of the progress of electrical science. They who were old, he said, would like to live longer out of sheer curiosity, to see what were to be the inventions of the future.

Mr. W. M. Mordey (President) in responding referred to the constant attacks made on British electrical engineers; far from being behind in the great business of electrical supply, and the use of electricity for all purposes, this country was well ahead. It was said that while they had cheap energy, they had in this country an enormous amount of foreign-made plant in their stations, but taking every kind of electrical plant, he found that in the British stations not 5 per cent. of the total had been imported from any other country. He believed that there was as much British electrical plant in protected countries, like Germany and America, as

there was foreign plant in this country, and probably a good deal more. British electrical engineering was the most progressive of any in the whole world.

Mr. A. R. Fearnley (hon. sec. Municipal Tramways Association and general manager of the Sheffield Corporation Tramways) proposed "The Leeds Local Section," and remarked that although the Section had only been in existence six years, it was to be congratulated on the membership, which stood at 250. From his recent visit to the Continent, he thought the British engineers were ahead of those abroad. He noticed in one particular works a quantity of plant of British manufacture.

The chairman, in his reply, reviewed the progress of the Section since its inauguration.

Councillor W. C. Fenton proposed "Kindred Associations," to which Mr. J. McLaren responded, and Mr. Harold Dickinson, the hon. secretary, proposed "Our Guests," to which Lieut.-Col. Lister responded.

A cordial vote of thanks was given the chairman on the proposition of Mr. J. F. C. Snell, seconded by Mr. T. Harding Churtor.

Mr. S. H. Smith gave a few humorous selections, and a musical programme was performed during the evening by Mr. Wallace Hartley's orchestra.

Central Technical College Old Students' Association.—The eleventh annual dinner of the Association was held at the Trocadero on Saturday last, with Mr. H. A. Humphrey, the new president, in the chair, over 100 members being present. After the loyal toast and secretary's (Dr. E. F. Armstrong) report, Dr. Bovey, F.R.S., proposed the toast of the "Old Students' Association and President," which was responded to by the chairman. The toast of "The Guests" was then proposed by Dr. T. M. Lowry, and responded to by Prof. Perry, F.R.S. A musical programme completed a successful evening.

Post Office Engineering Department, London.—The sixth annual dinner was held at the Grand Hotel, Trafalgar Square, on Tuesday, the 16th inst., Major O'Meara, C.M.G., engineer-in-chief, presiding. The guests of the evening included the Right Hon. Sydney Buxton, M.P., Postmaster-General; Sir Henry Babington Smith, K.C.B., C.S.I., secretary; Mr. A. F. King; Mr. H. S. Carey; Mr. A. M. J. Ogilvie; Mr. C. A. King; Hon. R. D. Denman; Col. Price, C.M.G.; Mr. W. M. Mordey, President of the Institution of Electrical Engineers; Dr. Walmsley; Dr. Fleming; Mr. F. Gill; Mr. E. A. Eames; Mr. J. W. Willmot, and others.

After the Royal toasts had been duly honoured, the Postmaster-General proposed the toast of "The Engineering Department"; he regretted that he was unable to say that the latest revision, which he hoped might improve the opportunities of the Department, had yet gone through its various stages. He congratulated the engineer-in-chief on the great success which attended his attendance, with Messrs. Purves and Hill, at the Buda-Pesth Conference—representing the various administrations interested in telegraph and telephone work. They had also made—thanks largely to the action of the engineer-in-chief—great strides in one section of their Department—that of wireless telegraphy; the Post Office had opened a very efficient wireless telegraph station at Bolt Head, and was likely from that to extend its operations in other directions. Wireless telegraphy would be one of the considerable tasks for the Engineering Department to undertake. They were also making very considerable additions day by day to the underground work for the protection of their telegraph lines. Hitherto they had not had sufficient authority in the country districts either for the construction of their lines or for their maintenance, or for the proper lopping of trees to make them effective; the Telegraph Construction Bill carried last year gave them those powers. They had been endeavouring during the past year to obtain telegraph and telephone poles from home sources rather than from Norway and Russia. They were looking forward to the time when they would take over the National Telephone Co., including, perhaps, Mr. Gill, and hoped that they might be able in the interval to smooth over the difficulties, which were great on both sides. He hoped that they might be able to come to some arrangement to carry on the construction work during the next three years, so that when the time came for the system to be taken over by the State, it might be in a satisfactory condition. He congratulated the Institution of Post Office Electrical Engineers on the great success which had attended its efforts.

Major O'Meara, in responding, said they very much appreciated the presence of the Postmaster-General, showing that he was taking a live interest in them and in their work. The gathering at Buda-Pesth would have far-reaching consequences; they were received with the greatest kindness by the officials of the Hungarian Administration. The French Government had issued an invitation for the next Conference to be held in Paris in 1910, and he had been authorised to accept that invitation. Remarking on the prominent position which engineers were occupying in the commercial world, he said the public had been rather too inclined to accept the work of engineers in the past without much comment; but the work of engineers had been brought home to them by the introduction of motor-cars, and now everybody was becoming an engineer.

Mr. Catley proposed the toast of "The Visitors," expressing the pleasure of the Engineering Department at seeing their old comrades who had lived the strenuous life that they were now living in the service, and who had transferred their lot to the more peaceful fields of retirement. He welcomed also the heads of other departments, and the Postmaster-General, without whom an occasion of this kind would be incomplete. He was very sorry that their old chief, Sir William Preece, was not able to be with them.

Sir Henry Babington Smith, in replying for "The Visitors," said they had special reason to be grateful to the P.M.G. for his success in the somewhat difficult task of persuading the House of Commons to pass useful legislation. The work of the Department was increasing and developing in many directions; they might congratulate the Department on a most successful year's work under the direction of the engineer-in-chief.

Mr. W. M. Mordey also replied for "The Visitors." He said he had been particularly anxious to come, because he felt that he would be amongst friends. He did not forget that he began his electrical work by 11 years as an operator in the Post Office. Speaking as President of the Institution of Electrical Engineers, which began in 1871 as the Society of Telegraph Engineers, he and all the other members of the Council regretted that to-day telegraphy occupied so small a part in the work of that Institution. In their new building on the Embankment he hoped they would be able to offer hospitality to the institution of Post Office Electrical Engineers, and that that hospitality might some day grow into a more intimate connection. He was told that the reason why so few of their members were telegraph men was that modern electrical engineering did not interest telegraph engineers, and that the two branches were separate and apart; he believed, however, that there were many improvements to be made in telegraphic and telephonic work by men who had been brought up in heavy electrical work, and he cited the example of Mr. S. G. Brown and his cable relay. He congratulated them on being the members of the most satisfactory State service in the world. He believed the day was coming when all great national services would be controlled by the State.

Mr. I. Probert proposed the toast of "The Chairman," remarking that when they reflected upon the magnitude of the engineer-in-chief's responsibility, the gigantic organisation of the engineering service, and the manifold generalities of the whole service he was at the head of, they must acknowledge that he deserved their most zealous aid in successfully carrying on the requirements of the Post Office Engineering Department.

Major O'Meara, replying to the toast of "The Chairman," expressed his thanks to Mr. Probert for his kind words, and to the members of the Department for their support.

I.E.E. Students' Annual Dinner.—This dinner, which was held on Thursday last week at the Holborn Restaurant, was a brilliant success, although the number present was smaller than expected. The musical programme was exceedingly good; the following items were among the best:—The Prologue from "Pagliacci," which was sung in excellent style by the chairman of the Students' Section, Mr. C. B. Nadaud; violin solo, by Mr J. S. Roberts, "Scène de Ballet;" Mr. Selwyn Driver's humorous songs, and two excellent pianoforte solos by Mr. E. W. Gritton. The guests of honour numbered about 20, and some excellent speeches were made.

Mr. W. M. Mordey, replying to the toast of "The President of the Institution," referred to his inaugural address, and incidentally said that on looking into figures he found that only 3 per cent. of the machinery in our power stations was of foreign manufacture. Dr. Kapp's remarks, in reply to the same toast, were much appreciated, and several students remarked in their speeches that they hoped he would be present at many more students' dinners, now that he had broken the ice.

Mr. R. Hammond, who proposed "The Students' Section," was in great form, and his humour was much appreciated by the audience. His tales of his recent visit to Turkey were very amusing, and were told in his admirable after-dinner style. The chairman, Mr. C. B. Nadaud, replied on behalf of the students.

Dr. Thompson's speech, in reply to "The Colleges," was, as usual, the speech of the evening; he gave some very interesting details of the life of the late Lord Kelvin, and in referring to the work he is now engaged on, viz., the life and work of Kelvin, he explained that it was as much a history of the development of the world during Kelvin's life as it was an account of his wonderful achievements. He also referred to the late Prof. Ayrton and his connection with the earliest technical education at Finsbury, and his work at the Central in after years.

Mr. B. Thompson proposed the toast of "The Guests," in reply to which Mr. Highfield, as usual, carried his audience with him, and showed that his interest in the Section was very great. Mr. P. Petrie also replied.

A vote of thanks to the chairman, moved by Dr. Kapp, brought a most enjoyable evening to a close. The number present was about 70.

Appointments Vacant—Engineering draughtsman for the Hackney Electricity Department (£150, rising to £180); switchboard inspector for the Hull Corporation telephone department; electrical engineer and general manager for Marylebone. Particulars as to salary, &c., appear in an advertisement in this issue.

American-German Patent Treaty—A Central News telegram from New York says that the Patent Treaty between the United States and Germany was signed on February 23rd. "The Treaty is understood to render unnecessary the establishment of American factories in Germany."

Football.—A match was played on Wednesday last, February 17th, on the home ground of the L.C.C. Football Club, at Peckham; the result was a draw, viz.:—L.C.C. Football Club, 1; Villa Wednesday, 1.

For Sale.—The Marylebone electricity department invites offers for 25 tons of scrap iron now lying at the Aybrook Street sub-station. Some particulars appear in our advertisement pages to-day.

Prevention of Scale by Electricity.—Mr. F. A. Lart writes at some length in the *Railway and Engineering Review*, and in a somewhat involved manner, on the above subject. Not that he professes to abolish scale by electrical means; he appears to consider that in some way electricity will prevent the induration of it. He begins by stating that electricity is generated in a boiler at work, and that matter in mechanical suspension, or even, in cases, in chemical solution, whatever that may mean, may be caused to deposit. He refers to the use of zinc in boilers, but we did not know that zinc was used as a scale preventer, or as a preventer of corrosion arising from the presence of scale, which is unusual. We know that corrosion will take place under some forms of sulphate scale, but this, we believe, is due to the liberation of acid through excessive heat, or to sesquioxidation of overheated damp iron kept hot by the poor conductivity of the thick scale. Zinc is usually employed as a food for acid water, being attacked in preference to the iron. The author then states his belief that scale will not form in a japanned or enamelled pan, because the enamel is non-electro-conductive. Here he is wrong, for it will form in such a vessel. He concludes, from this erroneous observation, that scale is deposited as a result of electrical action, and he advises the application of low E.M.F. currents to assist deposit. The whole article appears to be assumption without any proper scientific reasoning, and we have only noticed it because it might tend to lead astray men of small literary knowledge by its plenitude of parenthetic verbiage.

High-Speed Tool Steel.—Recently a commotion was created by the announcement of Prof. Arnold, of Sheffield University, that, within a year, a British steel of quadruple the cutting power of any steel now known would be on the market. The new departure was associated with the name of the well-known firm of Messrs. Jonas & Colver, of Sheffield, but inquiry has failed to elicit confirmation of Prof. Arnold's startling statement, and the Sheffield steel manufacturers have protested strongly against the latter, which, they say, has led to the countermanding of orders for old qualities of high-speed steel and has caused serious loss to those engaged in the trade.

Pollak-Virag System.—A demonstration of the Pollak-Virag system of high-speed telegraphy was given recently in the City. While improvements have been made in the apparatus employed, the system is essentially the same as was described in our issues of October 19th and 26th, 1900. It is a most beautiful device—a marvel of ingenuity; the writing, executed at a speed of forty or fifty thousand words an hour, would put to shame many contributors to the technical press, and it is fascinating to watch the tiny spot of light rapidly tracing out letters and words. We understand that a syndicate is being formed to take up the invention.

Brescia Electrical Exhibition.—Some copies of the programme and regulations of this exhibition can be obtained by British firms applying either at the Commercial Intelligence Branch, Board of Trade, 73, Basinghall Street, London, E.C., or at the Exhibitions Branch, 32, Great George Street, Westminster, S.W.

Copper.—The general tone of the copper market is quiet. Visible supplies, as shown in Messrs. Merton's circular for 15th inst., are slightly less than for the end of January, being at 52,239 tons, the decrease being principally in standard copper in London, Newcastle and Birmingham.

Institution and Lecture Notes.—Royal Institution.—Dr. H. A. Wilson, M.A., Professor of Physics at King's College, delivered a lecture at the Royal Institution on the 12th inst., entitled "The Electrical Properties of Flame." Commencing his discourse by showing the effect of a flame in discharging an electrometer, and in giving a charge to a mica plate, he showed that in flames and in the products of combustion passing therefrom, there was present free electricity of both positive and negative sign. The theory of the generation of this electricity was that the dissociation of the molecules of the gaseous constituents into atoms produced ions, negatively and positively charged. Using a series of three cylinders, contained within a chimney, and connected electrically to pith balls externally placed and electrically excited, he showed that the ions arising from the flame of a spirit lamp admitted to the chimney discharged in succession these balls. The first cylinder was quickly discharged because of its relative nearness to the flame, the second one more slowly, and the third still more slowly, showing that the positive and negative ions had partially recombined before reaching the upper part of the chimney. Using a pair of Bunsen gas flames, of approximately 7 in. total length, the lecturer showed that an electric spark passed through them as easily as through an air space of 1 in. length. As a parallel experiment he employed a glass tube 7 in. in length filled with air at a reduced density—namely, one-seventh of that of the atmosphere—and he showed that the spark passed through this as through the 1 in. of air of normal density, or the 7 in. of flame. Seeing that the temperature of the flames would be about seven times that of the atmosphere reckoned on the absolute scale, he observed that the inference to be drawn was that the density of the media was the controlling factor; for if the disparity in chemical composition were ignored, the rise of temperature in the flame would have brought about a reduction in density of from seven to one. If that inference were accepted, it followed that the density was of greater import than the increase of conductivity, due to the presence of ions existent in the flames; and that in any case the energy of the spark must be equal to the disruption into atoms of the molecules of the gaseous media. Coming to the question of the conductivity of a flame for a current of electricity, he showed that the current passed was proportional to the square of the number of cells generating the current, in contrast to a metallic conductor in which the rate was directly proportional. In order to obtain a long flame that should exclude short circuiting of the electric current, the lecturer employed a long horizontal Bunsen gas tube, into which were inserted numerous vertical quartz glass tubes. The latter being non-conducting and unaffected by changes of temperature answered the purpose effectively. Into this long flame was introduced a pair of platinum disk electrodes, and in the intervening space a wire that served to determine the potential of the current passing between these electrodes. This revealed the fact that just in front of the negative electrode there was a considerable fall in potential, succeeded by a small decrease as the distance to be traversed became greater. A flame devoid of dust particles or of metallic salts is like pure water, both have low conductivity, and a flame containing metallic salts is again like water containing electrolytes, the conductivity is raised in both cases. The resistance is greatest immediately in front of the negative electrode, and can be explained by adopting the view now largely accepted by the leading physicists, viz., that the negative ions are several thousand times as small as the positive ions.

Sheffield.—In a recent lecture at Old Firth College, Mr. S. E. Fedden gave an account of the changes and improvements which have been effected in electric glow lamps. During the last 20 years, he said, electrical engineers had never had anything among the many novelties which they had offered to the public, equal in excellence and efficiency to that now provided by the various forms of metallic-filament lamp. The tantalum lamp, brought out about 1905, was the first commercial metal-filament lamp, and it at once achieved an immense success. With the exception of the tantalum, all the metal lamps on the market belonged to the tungsten class. Urging the necessity of shades for lamps of high brilliancy, he pointed out the great mistake that is often made in shop window lighting in placing the new metallic lamps in exactly the same position as was formerly occupied by carbon lamps. The best practice for a shopkeeper to follow was to illuminate his goods scientifically, to have plenty of light but not waste it, to shield it from the eye of the shop gazer, and direct it upon the goods displayed. If he wanted further attraction let him use arc lamps in bunches and incandescent lamps arranged at a fair height above the pavement. By substituting for carbon tantalum lamps, they saved nearly half the cost, and by using tungsten nearly two-thirds of the cost light for light. The lamps thus offered more advantage than could be obtained from the old ones at half the present price of electricity. He did not recommend metal lamps in situations where lights were seldom used. Though less efficient, the tantalum lamp was more robust than the tungsten and better suited for places where there was much vibration, or where it must be moved about. The effect on electric supply undertakings of the new metallic lamp had been that the money paid by consumers for electric light had fallen off from 25 per cent. to 50 per cent., and out of this smaller amount a larger proportion now went to the lamp maker, and a smaller to the supplier of electricity. Just as the incandescent gas mantle eventually increased the business of the gas engineers, so electrical engineers realised that any immediate loss of revenue which might be entailed by a more efficient lamp would be amply made up by an increased field of business.

Liverpool and District Electrical Association.—On Tuesday, February 16th, a discussion took place at the Common Hall, Hackins Hey, Liverpool, the subject being "Motor Starters for Direct Current." The question was introduced by Mr. J. Greenhalgh, of Birkenhead, who dealt with the fundamental principles underlying the design of motor starters, selection of resistance wire, variation of resistance per step, calculation of resistances, &c., usual types of starters. There was considerable discussion, more particularly with regard to the overload and no load releases usually fitted to motor starters, quality of the types in general use, comments as to the inadvisability of cheap starters, suggested additional use of circuit-breakers in conjunction with starters, the starting of motors light, and the gradual picking up of the load through clutches, permitting the use of a simplified starter, and various other points. Owing to the late hour, it was decided to discuss the matter further on March 2nd.

Institution of Municipal Engineers.—The roll of this Institution is now:—Members, 466; students, 36; total, 502. It has been decided to hold a general meeting at Olympia on April 24th, on the occasion of the International Building Trades Exhibition, and another general meeting at Durham during the month of June.

Mr. H. Bell, the Hull city electrical engineer, gave a lecture on "Electricity and Electrical Engineering" to a Friendly Society gathering at Hull recently. The lecture was illustrated by about 100 slides.

Birmingham University Engineering Society.—On Thursday evening last week Sir Oliver Lodge delivered a very interesting lecture on wireless telegraphy. After giving a summary of the history of the subject, the lecturer explained what had been done by means of the Lodge-Muirhead system. They found that perfection of tuning could be obtained in spark telegraphy when the radiator and receiver were both persistent vibrators, which could be accurately tuned together, and they found successful results could be obtained only when these vibrators, consisting each of a pair of insulated aerials rested above the earth, contact with the earth having the effect of damping out vibration and thus spoiling tuning. The sensitiveness of a thoroughly tuned Lodge-Muirhead system was intense. Small power was sufficient, and the inductive connection of the collector to the receiving instrument might be separated by a surprising interval without stopping communication. An experiment was made in 1907 to see whether it was possible to discriminate between two adjacent stations, and it was found that

two sending instruments could work at once on the same aerial, bisected electrically, and at the distant station two receiving instruments could receive independently and simultaneously different messages from the corresponding halves. It had also been established by experiment that, under the non-earth conditions, every other station, even near and powerful ones, could be tuned out and their disturbances eliminated. The importance of the possession of power thus to hold conversations in the midst of disturbance without being affected by it, and the real danger of being without such power, was manifest. The principles of the system were laid down by him in 1897, but they had nothing revolutionary until 1900, when Duddell's singing arc came out, making it possible to transmit speech by wireless telegraphy. It was quite possible that a speech of Mr. Chamberlain's delivered in the Town Hall, Birmingham, might be transmitted to all parts of the British Isles. In 1908 they had Poulsen's system of wireless telephony.

Electrical Association at Montreal.—The electrical interests of Montreal have organised themselves into an association. Temporary offices have been taken, and the organisation is upon the same lines as the National Electric Contractors' Association of the United States. It is the intention of the Association to submit a by-law to the Quebec Legislature aimed at raising the standard in electrical construction, and a Committee has been named to draft this by-law. The officers elected for 1909 are:—President, E. W. Sayer; vice-president, J. A. Valois; treasurer, W. B. Shaw; secretary, W. A. Stanley; besides an executive committee of seven members.

Electrical Enterprise in China.—On Saturday evening, at a meeting of the Birmingham and District Electric Club, Mr. John J. Inniss, M.I.Mech.E., gave an interesting paper entitled "Notes on China and the Chinese." Mr. Inniss said that in a paper to engineers mention must be made as to the development of the country both electrically and mechanically. The use of electricity during the last few years has been rapidly increasing. At Shanghai the Council's undertaking has increased its plant during the last twelve months by the addition of two 800-KW. turbo-alternators and two high-speed steam dynamos, each of 600-KW. capacity, an increase of 2,800 KW. The turbines were the first large ones installed in China, and marked the beginning of a new era there in the application of steam prime movers, and he understood from his friend the engineer that their use had justified their adoption. Great saving had resulted from the use of mechanical appliances and the use of superheated steam, not only in the direction of a considerably reduced coal consumption, but they were recommended because of the very much more even firing and combustion obtained by the elimination of native hand labour with its idiosyncrasies. Shanghai was typical of the growth of electricity in many of the large towns of China. There, during the past twelve months, the lamp connections (in equivalent 8 C.P.) had increased by over 42,000. The electric motor was steadily gaining ground, for there were at the present time some 62 electric motors connected to the Council's mains aggregating 523 H.P. This total had been reached in less than four years. The number of units generated between January and October, 1908, was 4,245,010; during the same period in 1907 that figure was 2,876,720. Looking back to 1900 they found that in that year the total units generated were only 624,000. Owing to the growing demand the Shanghai Council had recently purchased a large plot of land on the river front whereon the erection of an additional power station would soon be commenced. A very extensive system of electric tramways was inaugurated while he was there early last year, and it was very creditable indeed to note that up to the present, not once since their inauguration had there been a stoppage of the supply of current from any internal cause at the electricity works. He believed that there was a large field in Shanghai for the use of electrical energy for industrial purposes. He visited the Hangyan Iron and Steel Works, which are situated just above the city of Hankow on the Han river, which empties into the Yangtze-kiang. These works were really an eye-opener. They cover an area of 120 acres. The iron ore is taken from large deposits in the "Zayeh" district containing a very rich magnetic ore in quantity sufficient for several hundred years. It would not be out of place to mention here that between 4,500 to 5,000 tons of pig iron were exported to Japan from the works every month. Needless to say, electricity was the driving and lighting power right through. The electric current for the supply of power and light for the works was produced by two electric stations in the works, furnishing direct current at 220 volts pressure. Two hydraulic stations supplied the works with high-pressure water at 750 lb. pressure per sq. in. There was a machine shop, electric repair shop, boiler shop, blacksmith's shop, the foundry, a bolt shop and a building for bricks and refactory materials. In the workshops at the Fongshan collieries belonging to the Chinese Engineering and Mining Co., electricity was the motive power, also of the sawmills. In fact, steam was being replaced, wherever possible, by electric power. The central power station comprised three alternators of 1,300 KW. each, driven direct by compound engines working at 140 lb. per sq. in. pressure, superheated 70° C. Before the installation of electric plant there were no fewer than 17 steam pumps distributed about the different levels underground, as well as a large hydraulic pump. This complicated system caused much inconvenience, and often entailed the stoppage of underground work. Now this was all changed, and the safety of the mine was ensured. The Chinese staff, under European supervision, had rapidly made themselves familiar with the electric work. Their electric fitters could repair a damaged motor as easily as a mechanical fitter repaired a steam engine.

Another Electrical Patent Revoked.—On the application of Mr. G. Braulik, the Comptroller-General of Patents has now revoked (under the Act of 1907) letters patent No. 23,606 of 1902, granted to Mr. Paul Högner, chief engineer of the German Company Körting & Mathiesen. He states that the main claim of the patent seems to him to be in substance anticipated by the Bremer patent, and in the arrangements between the German Co. and the Westinghouse Co. Högner's patent was apparently held of very small account. He says that on the evidence put before him, he is satisfied that the patented article is manufactured mainly outside the United Kingdom, and not to an adequate extent in the United Kingdom, and he does not see that there is any good reason which would prevent the patented article from being made in this country to an adequate extent by the patentees. The patent is, therefore, revoked forthwith, subject to appeal to the Court, and the patentees are ordered to pay 75 guineas costs to the applicant.

Dundee Electrical Contractors' Association.—Mr. E. J. B. Lowden presided at the annual dinner of the Dundee branch of the Electrical Contractors' Association. Proposing the toast of "The Electricity Industry," Mr G. B. Carmichael referred to the great strides the trade had made locally. Ex-Bailie Don, convener of the Corporation electricity department, replied, remarking that those engaged in the electricity business were pushing ahead and incidentally helping others. The toast of "Dundee Electricity Department" was given by Mr. J. Lockhart, who spoke of the extremely amicable relations existing between local contractors and the Corporation department. Responding, Mr. Harry Richardson, the Corporation electrical engineer, said the boom in electricity was at last beginning in the city, and, in spite of the bad trade during the past year, the electricity department had done extremely well. All the contractors needed to do was to push ahead, and there would be no lack of money to support them in their efforts to develop the business.

The B.E.T. and the Electrical League.—"Ordinary" writes under date February 23rd as follows:—"Apropos of the Electrical League, may I express the hope that the shareholders of the B.E.T. and its associated companies will enter a strong protest at the coming general meeting if the funds of these undertakings have been, or are being, expended in printing and issuing the 'pamphlet political.' In these days it may be that such 'high' dividends as we have been receiving from the B.E.T. and associated companies justify some expenditure (if it is being incurred by them) upon a political flutter. There is, of course, the cost of purchase or of printing as well as that of postage, letter paper, envelopes, typing, and the waste of time of the staff. If the expenditure is borne by the companies I daresay the different memoranda and articles are wide enough to legalise it."

Electric Shock Fatality.—At Westminster, on February 20th, an inquest was held into the death of James Charles Tickell, an electrician, aged 51, who received a fatal electric shock at the Bloomfield Street, New Bond Street, sub-station of the London Electric Supply Corporation. From the evidence, it appeared that he was lineman in charge, and had duties to perform in connection with some transformers. Deceased was formerly a chief torpedo instructor in the Royal Navy. The superintendent (Mr. John Freeman), on arriving at the works on Thursday morning last week, found Tickell lying on his back dead behind the transformer, he having received a 2,500-volt alternating-current shock. The medical evidence showed that death was due to suffocation, following an electric shock. A verdict of "Accidental Death" was returned.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

Central Station Officials.—MR. J. B. ATTRILL was presented with an engraved stop-watch, on February 16th, by the staff of the South Metropolitan Power Co., on his leaving to take up another appointment.

MR. W. F. LONG, the City Electrical Engineer, Cape Town, returned from a trip to Europe on January 25th.

The Electricity Committee of the Rochdale Corporation last week recommended that the salary of the electrical engineer (MR. C. C. ATCHISON) be increased from £350 to £400 per annum.

The Wirral (Cheshire) Board of Guardians has appointed MR. ST. CLAIR C. GASKIN, of Walton, Liverpool, to be chief engineer of the electrical department at Clatterbridge Union Buildings. There were 89 applications for the post, the salary of which is £2 a week and all found; and of the seven candidates selected for final choice, six belonged to Liverpool.

Tramway Officials.—Doncaster Corporation Electricity and Tramways Committee has appointed MR. WM. JAMES DRAFFIN, of Hull, as chief inspector of the tramways. There were 243 applicants for the post. Mr. Draffin has, since 1899, been senior tramway inspector at Hull.

General.—Mr. James Bastian, of 2, Lea Road, Heaton Moor, Stockport, has been appointed sole representative in the United Kingdom for the Bastian Meter Co., Ltd.

Mr. J. N Cooper, A.M.I.E.E., has resigned his position as manager of the electrical department of A. Emanuel & Sons, Ltd., with whom he has been for the last 14 years, and has joined the firm of Messrs. Plutte, Scheele & Co., 18 19, Queenbithe, E.C.

It is announced in the *Times* that Col. Sir Euan Smith is relinquishing the position of chairman of Marconi's Wireless Telegraph Co., but he will retain his seat on the board. Mr. G. Marconi will act as chairman in the future.

Mr. Ernest W. Short has resigned his position as engineer, sales department, in the Yorkshire Electric Power Co., in order to take up the duties of technical editor of electrical text-books with the International Correspondence Schools in Kingsway.

Mr. E. Freeman, late chief of Golder's Green Car Sheds, was presented on Saturday last, at Hampstead, with a tantalus and an address, as a token of esteem and respect from the staff and employés of Golder's Green Depôt. Mrs. Freeman was presented with a gold bracelet.

NEW COMPANIES REGISTERED.

P.-V. Syndicate, Ltd. (101,447).—This company was registered on February 5th, with a capital of £1,000 in £1 shares, to carry on the business of a telephone, telegraph, and electric light, heat and power supply company. The subscribers (with one share each) are:—P. B. Potter, 8, Francis Road, West Croydon, private secretary; A. K. Sterne, 4, Trafalgar Road, S.E., clerk, Private company. The provisional directors are P. B. Potter and A. K. Sterne. Registered by Slaughter & May, 18, Austin Friars, E.C.

Australian Electrical Co., Ltd. (101,546).—This company was registered on February 12th, with a capital of £100,000 in £1 shares, to adopt an agreement with F. J. Healey and A. J. Roberts, and to carry on the business of electricians, mechanical engineers, suppliers of electricity for motive power, light, heat or otherwise, manufacturers of and dealers in apparatus and machinery used in connection with the generation, distribution, supply, accumulation and employment of electricity, &c. The subscribers (with one share each) are:—D. Anderson, 20, Copthall Avenue, E.C., chartered secretary; F. A. Williams, 69, London Wall, E.C., private secretary. Private company: The number of directors is not to be less than two or more than five; the first are F. J. Healey, W. Thompson, F. A. Williams and D. S. Summers; qualification, one share; remuneration as fixed by the company. Each member shall have one vote for every share held by him up to 10,000 shares, but no member shall be entitled to more than 10,000 votes in respect of his holding. Directors' borrowing powers restricted to the amount of the company's nominal capital. Registered office, 20, Copthall Avenue, E.C.

Ados, Ltd. (101,544).—This company was registered on February 12th, with a capital of £1,000 in £1 shares, to carry on the business of electrical engineers and gas engineers, suppliers of electricity for light, heat, motive power, and otherwise, &c. The subscribers (with one share each) are:—P. Willis, 39, Charing Cross Road, W.C., gentleman; J. E. Wells, 125, Canwick Road, Lincoln, electrician; S. E. Smith, Coulby House, Lincoln, engineer; Ada Smith, 115, Carholme Road, Lincoln, cashier; A. Willis, 68, Gravelly Hill, Birmingham, engineer; E. Davison, 37, Canwick Road, Lincoln, electrician; E. Voss, Ashbourne House, Lincoln, merchant. The numbers of directors is not to be less than two, or more than five; the subscribers are to appoint the first; qualification, £100. Registered office, Francis Court, Lincoln.

Russian Public Works and Construction Co., Ltd. (101,556).—This company was registered on February 12th, with a capital of £10 000 in £1 shares, to carry on in Russia and elsewhere the business of financiers, bankers, contractors for the construction or working of railways, electrical works, tramways, canals and gas and water systems, &c. The subscribers (with one share each) are:—H. B. Banks, 47, Victoria Street, S.W., railway contractor; G. C. Bellucci, 47, Victoria Street, S.W., engineer. Private company. The number of directors is not to be less than two or more than seven; the first are J. B. Banks and G. C. Bellucci; qualification (except first directors), 250 shares; remuneration, £100 per annum, divisible. Registered office, 47, Victoria Street, S.W.

Appareil Magnetique, Ltd. (101,454).—This company was registered on February 6th, with a capital of £100 in £1 shares, to carry on the business of medical electricians and mechanicians, electrical masseurs and therapeutists, manufacturers of and dealers in electrical and surgical appliances, &c. The subscribers (with one share each) are:—J. M. Michelen, 9, Walbrook, E.C., journalist; H. O. Goodwin, 147, High Street, Homerton, N.E., merchant; H. Bastow, 147, High Street, Homerton, N.E., merchant. Private company. The number of directors is not to be less than two or more than five; the first are not named.

Steel Wings Wind Turbine Co., Ltd. (101,559).—This company was registered on February 12th, with a capital of £5,000 in £1 shares, to acquire Patent No. 14,082 of 1906, for the United Kingdom, in respect of an invention for an improved head frame for windmills, to develop and turn to account the same and to carry on the business of suppliers of motive power for or in connection with electric lighting, water supply, traction, and other purposes, &c. The subscribers (with one share each) are:—R. W. Stuart, 285, Finsbury Pavement House, E.C., gentleman; J. A. Leeming, 87, Palewell Park, East Sheen, electrical engineer. Private company. The number of directors is not to be less than two or more than five; the first are R. W. Stuart, J. A. Leeming and J. Thame. Registered office, St. Stephen's House, Victoria Embankment, Westminster.

Patent Telephone Recorder Co. (Continental), Ltd. (101,518).—This company was registered on February 10th, with a capital of £1,000 in £1 shares, to adopt an agreement with J. A. Gamble and C. F. A. Meger, and to carry on the business indicated by the title. The subscribers (with one share each) are:—T. A. Hanmer, 9, Cook Street, Liverpool, chartered accountant; W. H. M. Draper, 10, Victoria Street Liverpool, solicitor. Private company; the number of directors is not to be less than two or more than four; the first are T. A. Hanmer and W. H. M. Draper; qualification, 50 shares; remuneration as fixed by the company. Registered by H. T. Woodrow & Co., 3, Cook Street, Liverpool.

Rossendale Valley Tramways Co., Ltd. (101,566).—This company was registered on February 15th, as a re-incorporation under the Companies' Acts, 1862 to 1907, of a concern originally constituted by the Rossendale Valley Tramways Act, 1888. Capital £85,640 in £10 shares (8,000 ordinary and 564 preference). 5,000 ordinary and 564 preference shares had been taken up and paid for in full to February 10th, 1909. Registered office, 61, Gracechurch Street, E.C.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

British Tramways and General Construction Co., Ltd. (78,084).—This company's annual return was filed on December 19th, when 241,000 shares had been taken up out of a nominal capital of £300,000 in £1 shares. £241,000 has been received. Mortgages and charges: £11,839 15s. 9d.

Halpin's Patent Thermal Storage, Ltd. (73,347).—This company's annual return was filed on January 4th, when 10,705 shares had been taken up out of a nominal capital of £12,000 in £1 shares. £5 per share has been called up on 4,705 shares, resulting in the receipt of £4,318, £387 remaining in arrears. £6,000 is considered as paid. Mortgages and charges: Nil.

Adelaide Electric Supply Co., Ltd. (84,209).—This company's annual return was filed on January 18th, when 27,000 preference and 26,065 ordinary shares had been taken up out of a nominal capital of £300,000 in 30,000 ordinary and 30,000 preference shares of £5 each. £5 per share has been called up on 27,000 preference and 65 ordinary, resulting in the receipt of £135,245, £80 remaining in arrears. £130,000 is considered as paid on 26,000 ordinary. Mortgages and charges: Nil.

South London Electric Supply Corporation, Ltd. (50,392).—Particulars of £150,000 debenture stock, created December 10th, 1908, and secured by trust deed dated February 2nd, 1909, filed pursuant to Sec. 10 (3) of the Companies' Act, 1907, the amount of the present issue being £100,000. Said trust deed also registered. Property charged: The electrical undertaking constituted by the Lambeth Electric Lighting Order, 1892; certain freehold hereditaments at Denmark Hill, Lambeth; and the company's undertaking and property, present and future, including uncalled capital. Trustees: Merchants' Trust, Ltd., 68, Cornhill, E.C.

Consolidated Electric Works and Appliances, Ltd. (101,022).—Particulars of £7,500 debentures, created January 12th, 1909, filed pursuant to Sec. 10 (3) of the Companies' Act, 1907, the amount of the present issue being £2,500. Property charged: The company's undertaking and property, present and future, including uncalled capital. No trustees.

CITY NOTES.

Westminster Electric Supply Corporation, Ltd.

The ordinary general meeting of this company was held on Wednesday at the offices, Eccleston Place, Lord Suffield presiding.

The Chairman, in moving the adoption of the report (see Electrical Review, February 19th, page 315), said that the company had had another satisfactory year, and the business continued to grow. The directors recommended the same dividend as last year, 10 per cent., and the carrying forward of a larger balance. Last year it was pointed out that it had been their policy in the past to carry forward a larger balance when about to reduce the price of electricity. The introduction of the metal-filament lamps was also referred to as having the same effect as a reduction in price, and the board, therefore, looking forward to the possible effect of their more general use, recommended that this year they should carry forward the increased profit. The manufacture of these new lamps had improved during the year, and a considerable number were now in use on their circuits, but there was room for further improvement, and as they were still somewhat expensive, it was by no means economical to use them everywhere. They might, however, expect a considerable extension of their use in the near future, and welcomed them as giving increased power of competition with gas. The larger profit this year was due mainly to the economical working of the station of the central company at Grove Road, which company were joint owners with the St. James' and Pall Mall Co. They obtained the Act to establish the central company 10 years ago, and perhaps it would be of interest to compare their position now with what it was then. In 1898 the company had 4,550 consumers and sold 5,000,000 units at an average price of 5½d. a unit, while their costs, including distribution, maintenance and depreciation, rates, taxes and insurance, were 3½d. a unit. In 1908 they had 8,660 consumers; they sold 18½ million units, the average price being 3½d. a unit and the costs 2½d. a unit. Thus, in the ten years, they had nearly doubled their consumers, and were now selling between three and four times as many units as they were then, while they had reduced the price and the costs per unit by roughly one-third in each case. In the same period their accumulated funds had been increased from £65,000 invested in the business to £288,000 invested entirely outside. The effect of investing these funds in first-class securities outside the business was immensely to strengthen the financial position, although they naturally earned a lower rate of interest than if they were in the business. The very heavy rates paid by the London electric lighting companies were often overlooked. Every now and then there was a flourish of trumpets because on some rare occasion some undertaking owned by a municipality had made a small contribution in aid of the rates. But they seldom heard of the far larger contributions from the rates which had to be levied to meet the recurring deficits of other municipal undertakings, nor of the prices which these municipalities charged themselves for the current they used. In 1898 the company paid in rates £3,517, or 5 per cent. of their total expenditure, and though they were only making half the profit per unit they were making 10 years ago they were actually paying 50 per cent. more per unit in rates. If the rates in 1908 had borne the same proportion to the profits as they did in 1898 (which was not an unreasonable way to look at the matter) they should have paid £10,000 less last year, and as their rates per unit would even then have been higher than those paid by the

average municipal undertakings in London, they might fairly claim that they were now making a contribution of at least £10,000 a year to the rates. They had some small consolation in knowing that the rates had lately slightly decreased; had it not been for this they should have paid £1,300 more last year. There was another myth he would like to expose. They had been accused on more than one occasion of paying enormous dividends, the inference being that they had been exploiting their consumers for their own benefit. This charge was utterly unfounded, for the interest they had paid on capital since they commenced working averaged only 6¾ per cent. The holders of ordinary shares had received more because it was they who took the risk, but a large proportion of their capital had been raised at rates of only 3½ or 4½ per cent. No one could say that 6¾ per cent. was an excessive rate of interest having regard to the nature of the business, while the fact that the average price had been reduced nearly 2d. a unit in the last 10 years, and that they were now supplying current for power at 1d. a unit (which was about the lowest price it could be obtained for anywhere in the world) should be sufficient evidence that they fully recognised their public obligations. The Bill they promoted last year had been passed, and they hoped and believed that they had now seen the last of these attempts at unfair competition which they had had to spend over £12,000 in fighting against during the last four years. Their opponents could only have been successful by seriously injuring the company's business, while they were convinced that the consumers would not have benefited by their proposals in the slightest degree. In fact, the most sanguine estimates of the promoters of the last Bill showed a reduction of only half a farthing a unit six years hence. The result of the prolonged fighting had been that the various undertakings in London were now at last allowed to associate and work together. The board were satisfied that this solution was the right one, and only regretted that the four years' delay should have made it more difficult to carry out. The Government are introducing a Bill this year to make their company, and those who with them promoted the Act of last year, purchasable in 1931 by the London County Council, instead of by the Council of the City of Westminster. A similar alteration was made in the purchasing authority in the case of the other companies last year. The only other matter he had to touch upon was the question of the Millbank Street station. He had hoped to be able to give some information as to the result of the Arbitration, but although the evidence had been taken as to the sum which the London County Council had to pay for reinstating them on the new site, the award had not yet been made. The question was thus still *sub judice*, and he could do no more than mention it.

Mr. Roger Wallace, K.C., seconded the motion, and the report was adopted without discussion.

Kensington and Knightsbridge Electric Lighting Co., Ltd.

The directors, in their report of the position of the undertaking at the end of 1908, state that the renewal account now stands at £78,197, being an increase of £8,794. After providing for the amount placed to renewal account, and after paying the dividends on the 6 per cent. first preference shares to June 30th, 1908, on the 5 per cent. second preference shares to September 30th, 1908, and an interim dividend at the rate of 8 per cent. per annum on the ordinary shares for the first half of the year, the balance standing to the credit of the net revenue account for the year 1908 is £8,165. Of the above sum £1,500 has been appropriated to the payment of the first preference dividend to the end of the year, and £625 has to be set aside to meet the portion of the dividend on the second preference shares accrued to the same date. It is proposed to pay out of the balance of £6,040 a further dividend on the ordinary shares at the rate of 8 per cent. per annum, for the past half-year, making with the interim dividend paid on August 14th, 8 per cent. for the year. This will leave a balance of £1,840 to be carried forward. The Bill promoted by the company jointly with the Westminster, St. James' and Notting Hill Co.'s, received Royal assent, and the directors consider that the passing of this Act and of the Act promoted by the rest of the London companies, will be beneficial to this and to all the other London electric supply companies, and it is hoped that this will prevent, for some years to come, the recurrence of the contests before Parliamentary Committees, which during the last few years have proved so costly, and in other ways detrimental to the interests of the shareholders.

Underground Electric Railways Co. of London, Ltd.

Sir Edgar Speyer presided on Wednesday at Hamilton House over a meeting of this company.

In moving the adoption of the report (see Electrical Review, February 19th, p. 310) the Chairman expressed unqualified satisfaction at the results attained. These results were far behind what they ultimately hoped to achieve, but they were in excess of the estimates given in the scheme last year. Sir George Gibb then estimated that the deficit for the year 1908 would be £54,000. The actual shortage was only £12,000. The three Tube companies had gone ahead in a most remarkable way, and gave fair promise for the future. The two elder ones were now earning handsome surpluses over their debenture charges, and were paying 4 per cent. on their preference and ¾ per cent. on their ordinary capital. These companies were, therefore, well on their feet and could walk without the assistance of the Underground Co. The Hampstead Tube, the youngest enterprise, had a surplus of over £6,000, which they carried forward. His prediction that the development of that district would surprise everybody was being more rapidly fulfilled than even he expected. He advised all those who were interested in this railway to pay a visit to Golder's Green and see with their own eyes the surprising activity that was going on there. He was satisfied that this railway had as great, if not a greater, future than any of the Tubes, and that in a few years a very material growth would be shown. The District Railway had also made remarkable progress, and had converted a shortage of £45 000 on the debenture interest for the last half of 1907 into a small surplus for the same period of 1908. When addressing them in May, 1908, he expressed the view that the traffics of the Tubes would rapidly grow as their usefulness to the inhabitants of London was more appreciated and their geography became better known. He had pointed out on a former occasion that the gross increases would be practically net increases. This had come to pass. In 1907 the three Tubes carried 56,771,000 passengers. In 1908 the three Tubes carried 85,860 000 passengers, whereof 12,000,000 were due to the Hampstead Tube having been opened on June 22nd, 1907. The operating expenses of the three Tubes had gone down from 67·9 per cent. of gross receipts in 1907 to 54·5 per cent. in 1908, and he might therefore claim for these railways that they were the most successful of all English railways for the year 1908, showing the largest increases on record and the greatest decreases in working expenses. The principal increases had occurred in through passengers. The chairman referred to the London United Tramways as the only disappointing child, which had suffered mainly from severe motor-'bus competition. He fully approved of the policy of the tramway company in reducing the preference dividend to 2½ per cent. per annum, which was necessitated by the exigencies of the case and demanded by a due regard for the conservatism which should prevail in an enterprise of so fluctuating a character. Besides being dependent on weather conditions, they were handicapped by the low speed limit of 6 to 8 miles per hour imposed upon them with other onerous regulations by the Board of Trade, while the motor-'buses were comparatively free from such regulations, and were allowed to travel at the rate of 12 miles per hour, at the same time damaging the track and the wood pavement which the tramway company had to maintain. The tramways had also to contend against compulsory stops and to provide workmen's cars at low fares, from both of which disadvantages the 'buses were free, while nothing was done by the Government, which only promised to give "earnest consideration" to the traffic problem. The tramways company had promoted a Bill, with the full approval and support of the Underground Co., to meet the emergency soon arising owing to the London County Council having the right, by the London United Tramways Order, 1895, to apply to the Board of Trade for power to acquire the portion of the company's tramways within the County of London in August, 1909, or within six months thereafter. Questions of great public importance were involved, but he would only say now that he hoped they would be settled in an amicable and business-like spirit. The dislocation of the elaborate system of through cars and through bookings sanctioned by Parliament would be to the detriment of the public, and in derogation of the rights secured to them by the Tramways Companies' Acts. The general condition of London traffic had not improved since he last referred to the subject, but there had been an important contribution to the literature on the subject in the Board of Trade Report by Sir Herbert Jekyll, which endorsed the main conclusions of the Royal Commission on Traffic, and recommended a permanent Traffic Board. There had also been a deputation to the Prime Minister on the same question, but he did not expect much from that quarter in the near future. They must, therefore, make the best of a difficult situation. A certain amount of competition was in the public interest, but the public were already protected by Board of Trade regulations and Parliamentary control, and he reminded his hearers that one of the most efficient and popular railways in the country, the North-Eastern, was practically free from competition. Those who had studied the question seemed of opinion that for London centralised management of all traffic agencies would serve the public interest best, and this was practically what the Board of Trade Report recommended. The necessity for economy was so patent that combination must come in London as it was coming in the big railway systems of the country. The underground railways suffered from competition from municipal tramways aided by the rates, and motor-'buses, which were practically free of rates and taxes, but were, nevertheless, unable to work at a profit with their present scale of fares. Still, so long as the ratepayers and shareholders acquiesced in this, the Underground Co. must strive against these difficulties unaided. They hoped to do so by giving the public the most perfect and reliable service possible. Their system was new, but they were studying how to improve each station so as to make the system of underground travel as perfect as possible. In spite of the generally unsatisfactory condition of the traffic problem, the outlook for the system justified the hope of material improvement. The estimated deficit for 1909 had been set down at £91,000, but in view of their experience in 1908, he believed that figure would be considerably reduced. The growth, however, could only be gradual. The capitalisation, too, was heavy.

Lord George Hamilton seconded the motion, and the report was agreed to without discussion.

Rio de Janeiro Tramway Light and Power Co., Ltd.

—It is proposed to increase the capital and issue 62,500 shares of 100 dollars each at par to the existing shareholders.

Mather & Platt, Ltd.

THE annual meeting was held at Manchester on Wednesday. The report of the directors then submitted showed that the net profits for the year, after charging depreciation and making provision for directors' remuneration and expenses, are £139,455 (against only £125,677 last year) to which is added the balance brought forward £16,057, showing an available total of £155,512. The preference dividend, and the interim dividend on the ordinary shares paid on September 1st last, for the half-year to June 30th, 1908, absorbed £30,000, leaving for disposal £125,512. The directors recommended that this sum be appropriated as follows:—Dividend of 5 per cent. per annum on preference shares for the half-year December 31st last £10,000, dividend at the rate of 10 per cent. per annum (free of income-tax) on ordinary shares for the year to December 31st last (less interim dividend paid in September) £20,000, bonus of 7½ per cent. (free of income-tax) on ordinary shares £30,000, transfer to reserve account (bringing up the amount to £375,000) £35,000, carrying forward £30,512, £125,511 16s. 10d. The dividends will be payable on March 1st. The board have elected Mr. Loris Emerson Mather a director of the company. The ordinary dividend and bonus together are 2½ per cent. higher than last year, and the carry forward is much higher, being £30,512 as against £16,057.

Prospectuses.—*Waste Heat and Gas Electrical Generating Stations, Ltd.*—This company has been offering a new issue of 65,000 shares of £1 each.

Southern Electric Tramways Co., Buenos Ayres.—An issue of £100,000 5 per cent. first mortgage debentures has been offered for subscription at 96 per cent. The list was to close last Saturday.

British Canadian Asbestos Co., Ltd.—$700,000 first mortgage 25-year 5 per cent. gold bonds in this company have been offered this week at 95 per cent.

La Plata Electric Tramways Co.—This company has been offering for subscription 170,000 6 per cent. cumulative preference shares of £1 each at par. The company takes over the La Plata and Ensenada Tramways Co.

Hurst, Nelson & Co., Ltd.—The list was to close on Wednesday in an issue at par of 20,000 6 per cent. cumulative preference shares of £10 each, of which 4,636 were already applied for. The vendors take 11,500 ordinary shares of £10 each, fully paid, as part of the purchase price, the remainder of the total of £289,845 to be paid in cash. For the last three years the average profits had been £41,173. After paying £12,000 for preference dividend, £29 173 remains to provide for certain depreciation, directors' fees, reserves and ordinary share dividend. The business is an old-established one (29 years), and it has rolling stock works at Motherwell, Chesterfield and Bridgend.

Yorkshire Electric Power Co, Ltd.—Mr. A. G. Lupton presided last week at the half-yearly meeting held at Leeds. He said that the most important point in the report was that the company had begun to work off the adverse balances from the first years of construction and development. This result was very encouraging, especially when the general slackness in all the industries was remembered. Had the trade conditions of 1907 continued, the sale of electricity to ordinary consumers would have been some 25 per cent. greater. There had been an increase of 63 per cent. in consumers connected to the mains, whilst the energy sales had only increased 31 per cent. This showed the difficult period through which they had passed, and so soon as trade improved the company would gain all the greater advantage from this deferred progress. The new overhead mains in the direction of Barnsley had been erected, and he might say how satisfactory it was that these overhead lines were now permitted, as they enabled electricity to be carried through the less populous parts of area at a reasonable cost. Textile factories had been the most important users of energy. In 1905 the first woollen mill in England to be electrically driven throughout was supplied by the company. To-day the company had 27 textile mills wholly or partly driven from their mains. A considerable demand was also made from various collieries, and it was likely that collieries would play a very important part in the future of the company. A large amount of current was now already being given for coal-cutting, pumping, ventilating, &c., and as the scale of charges of the company showed colliery proprietors considerable saving, it was confidently expected that the colliery demand would greatly increase in the near future. Much attention had lately been directed to the utilisation of waste heat gases from blast furnaces and coke-ovens. The directors had been watching this, and it was possible that they might soon avail themselves of this source of economy.—The report was adopted.

W. T. Henley's Telegraph Works Co., Ltd.—In their report for the year 1908, the directors present accounts showing a net profit of £71,274. After payment of directors' and auditors' fees, and debenture interest, and making allowance for depreciation of buildings, plant, machinery, &c., there remains £52,196, making, with £23,650 brought forward from last year, a total of £75,846. The directors have transferred £10,000 to the reserve account and recommend the payment of a dividend on the ordinary shares of 15 per cent., free of income-tax, of which an interim dividend of 5 per cent., less income-tax, was paid on September 1st last. These payments will, together with the preference dividend for the year, amount to £50,500, leaving a balance of £25,346 to be carried forward. Dividend warrants will be posted to the ordinary shareholders on March 1st. The meeting is to be held on that day.

Stock Exchange Notices.—Applications have been made to the Committee to allow the following securities to be quoted in the Official List:—

British Westinghouse Electric and Manufacturing Co., Ltd.—£250,000 6 per cent. prior lien debentures of £100 each, in lieu of the scrip now quoted.

Primitiva Gas and Electric Lighting Co. of Buenos Ayres, Ltd.—Further issue of £30,000 4 per cent. first debentures of £100 each.

The Committee have appointed a special settling day as under:—

Thursday, March 4th.—Monterey Railway, Light and Power Co.—Scrip, fully paid, for £1,000,000 5 per cent. first mortgage debenture stock.

Telegraph Construction and Maintenance Co., Ltd.—The directors' report states that the accounts for the year 1908 show a net profit of £61,896, after charging the interest on the debentures. To this sum must be added £109,445 brought forward from last year, making a total of £171,341. From this amount is deducted the interim dividend of 5 per cent., paid July 21st, 1908, amounting to £22,410, leaving £148,931 to be dealt with. Of this sum, the directors propose to distribute a dividend of £1 4s. per share, absorbing £44,820, being at the rate of 10 per cent., and making, with the amount already paid, a total dividend for the year of £1 16s. per share, or 15 per cent., free of income-tax, leaving £104,111 to be carried forward. The general business of the company during the past year has been satisfactory. The company's works and steamships have been maintained in their usual state of efficiency. The company's 4 per cent. debentures, which matured on January 1st last, are being further extended for a period of 10 years from that date, at the same rate of interest.

Dublin and Lucan Electric Railway Co., Ltd.—Mr. W. Mooney presided at the half-yearly meeting held in Dublin last week. In reviewing the position of the company, he said that all that they wanted now as a real incentive was that a sufficient number of residences should be built along the route. They had much improved their carriages by heating them electrically. The report was adopted.

Victoria Falls Power Co., Ltd.—This company held an extraordinary general meeting at Salisbury House, E.C., on February 18th, at which it was resolved to change the name to the Victoria Falls and Transvaal Power Co., Ltd. The Marquis of Winchester, who presided, delivered a speech regarding the position and work of the company, and said that they now proposed to further extend their operations on the Witwatersrand, and having regard to the magnitude of their present and prospective business in the Transvaal, they recommended the alteration of name, as it better represented the scope of their business.

Northampton Electric Light and Power Co., Ltd.—The report for 1908 states that the year shows better results than any similar period since incorporation. The mains have been extended in various directions, making the total mileage 21 miles 664 yd. It was found possible to carry on necessary works without additional share capital, but extensions of plant will be necessary during the present year, in order to meet the largely increasing demands, and further shares will be offered for subscription. £2,000 is added to the depreciation account, £200 is written off motors, and £500 is placed to commence the formation of a reserve fund, leaving an available balance of £1,870. After paying the 5 per cent. preference dividend, it is proposed to pay 5½ per cent. per annum on the ordinary shares, making 5 per cent. for the year, and to carry forward £238.

Mexican Light and Power Co, Ltd.—We read in the *Financial Times* that at the annual meeting of this company, held in Montreal on 17th inst., the directors nominated by the Mexico Tramways Co. were duly elected, and Dr. F. S. Pearson will now occupy the position of president. Mr. Miller Lash attended the meeting on behalf of the Mexico Tramways Co, representing upwards of 81,000 shares in the Mexican Light and Power Co., Ltd., which are now owned by the Tramways Co., and, in addition, he was supported by the proxies of other independent shareholders, owning about 25,000 further shares.

Galloways, Ltd.—After paying the interim dividend on the preference shares, transferring the reserve fund of £6,409 to profit and loss account, and writing off £3,117 for depreciation, there is, according to a financial daily, a debit balance of £2,636 to be carried forward.

Charing Cross, Euston and Hampstead Railway Co.—Sir George S. Gibb presided over the twenty-fifth half-yearly meeting of the above company, held on February 18th at Hamilton House. The Press were not admitted.

County of London Electric Supply Co., Ltd.—The directors have decided to recommend payment of final dividends upon the preference shares at the rate of 6 per cent. per annum for the half-year ended December 31st, 1908, less income-tax, and on the ordinary shares, at the rate of 6 per cent. per annum, less income-tax, for the half-year ended December 31st, 1908, making 5 per cent. for the year on the ordinary shares. The sum of £16 000 has been placed to reserve for depreciation, and about £3,700 carried forward. Last year the dividend was at the same rate, £25,000 was placed to reserve, and £4,881 carried forward.

Italy.—A new company has just been formed in Milan, with a capital of £36,000, and with the title La Societa per Imprese Electriche del Piemonte "Orientale."

Aluminium Corporation, Ltd.

On February 17th the adjourned statutory meeting of this company was held at Winchester House, Mr. A. H. Gibson presiding.

The Chairman said that as they were aware, the company had appointed Mr. L. W. Hawkins and himself as joint liquidators, but Mr. Hawkins had resigned his position. They would remember that at the last meeting it was reported that the liquidation scheme, as then proposed, could not be carried out because it was found that the cost of completing the works would be more than was anticipated. Accordingly the liquidators had to take steps in other directions. On the afternoon of January 20th, at a meeting of shareholders and creditors, a scheme was submitted providing for a 7s. 6d. assessment on the existing shares; £50,000 to be raised by "A" debentures, and the payment to the creditors of 10s. in cash and 10s. in "B" debentures. That proposal was not at all favourably received. They therefore had to consider what could be done, apart from the reconstruction, and so Mr. Graham approached the British Aluminium Co. and asked them if they were prepared to make an offer. The liquidators saw Mr. Touche on the evening of January 20th, and he intimated that the matter would receive the consideration of his co-directors. On January 26th the liquidators interviewed Mr. Tudor Smith, who was virtually the only debenture-holder, and that gentleman put forward certain suggestions, but they were such that the liquidators did not think it advisable to go into them at all. A further meeting of the shareholders' committee and the creditors was held on January 29th, when another scheme was put forward providing for an assessment of 5s. 6d. per share and 10s. in cash, and 10s. in the £ preference shares, ranking alongside assessment. The creditors' committee agreed to lay that proposal before the general body of creditors, but without any promise to recommend its acceptance. On February 3rd the liquidators received a letter from the British Aluminium Co. offering to purchase the undertaking on the following terms: £50,000 in cash for the assets; 10 000 fully paid 6 per cent. £5 shares; and 90,000 6 per cent. preference shares of £5 each, of which £2 10s. had been paid, leaving a liability in the last-named shares of £24,500. So that the terms were briefly—£50,000 in cash; £50,000 fully-paid preference shares, and £24,000 partly-paid shares. Mr. Graham had some correspondence with Mr. Touche on the matter, and the latter gentleman replied in answer to a question that if it was preferred, the partly-paid shares would be eliminated from the terms. There were also further conditions named by the British Aluminium Co. as to the contracts made by the Aluminium Co. However, after looking at the matter from all points of view, the liquidators had come to the conclusion that it would be better to reconstruct the concern than to sell it. The chairman then dealt at length with a circular which had been issued containing the proposals for reconstruction, from which it appeared that the creditors were to be paid 10s. in cash and 10s. in shares. The principal sums that would have to be met under the reconstruction scheme would be £39,000 estimated payment to unsecured creditors, and £41,000 for working capital, contingencies and expenses. The liquidators had had various other claims from creditors, but they were such that if the reconstruction scheme was carried out they would not amount to anything. If, however, a compulsory winding up of the company was made the claims would be very considerable. Many other items would also pass away in the event of reconstruction. They had had a large number of promises of support in the event of the company being continued. He had received a letter from Mr. Scott, the chairman of the creditors' committee, who had put forward a scheme whereby the creditors should receive £60,000 in cash and £50,000 in preference shares. That gentleman also suggested that in order to provide working capital the company should raise £20,000 more capital. He (the chairman) could only say that he did not agree with Mr. Scott's proposals as it left the company without sufficient working capital. He thought that the creditors would see that they were equally as interested in the welfare of the company as the shareholders, for under the reconstruction scheme they would hold shares.

Mr. Scott, Chairman of the creditors' committee, said that they regarded the reconstruction scheme as being more favourable for them than being taken over by the British Aluminium Co. Obviously the scheme was the better one, as the creditors besides getting cash got shares in well secured stock. The creditors felt that the shareholders through their liquidators had had a fair term of putting the business right, and they considered that they should now appoint a sole liquidator. They did not suggest that in any unfriendly spirit; on the contrary, their relations were most friendly, but they did think that their interests should be protected. He accordingly moved a resolution to the effect that Mr. Robertson Lawson be appointed sole liquidator of the company, and that Mr. Scott, in conjunction with the other members of the creditors' committee, be authorised to make such application before the Court.

Mr. Wylie seconded.

A Creditor asked whether the company had received a claim from the Aluminium Foil Patents for £78,000.

Mr. Graham said that a claim had been made, but in his opinion there was a claim against the vendors of the patent, and not against the company.

The same Creditor remarked that he thought it right to say that the Foil Co. were bringing an action against the company. He would not say whether they had a good claim or not, but should they be successful it would have a considerable effect on the company's finances. He thought it would be an advantage for the company to have a subsidiary company so as to get rid of the aluminium which was produced.

Replying to another creditor, Mr. Graham said that allowance had been made in the estimates for claims.

Mr. Robb (Messrs. Brownlie & Murray, who are the petitioners for the winding-up of the company), said that his clients were in favour of the creditors having a liquidator. They were, however, doubtful whether a liquidator could be appointed before the date when the winding-up petition was heard. He moved a resolution providing that in the event of the liquidator not being appointed on or before February 27th, the date when the winding-up petition will be heard, his clients should make an application for a liquidator to be appointed.

After further discussion this was defeated, and Mr. Scott's original resolution was carried.

[The matter came before the Courts this week, and the result is mentioned in our "Business Notes" under "Dissolutions and Liquidations."]

Electric Supply Corporation, Ltd.

The seventh annual general meeting of this company was held on Thursday of last week at Salisbury House, Mr. J. B. Stone presiding.

In moving the adoption of the report (see Electrical Review, February 12th, page 267), the Chairman said there had been an increase of 20 per cent. in the lamp connections compared to the previous year. This was satisfactory when they recollected that in 1907 there was a large increase over the previous year. He had no doubt that during the past year a still better result would have been shown if they had been in the position to add to the mains more rapidly. They thought the metallic-filament lamps would be a great assistance in popularising the use of electricity and bringing in new consumers. In the case of Chelmsford, and the smaller towns in Scotland, where the supply was started before the metallic-filament lamps were brought on the market, the reduction in accounts of old consumers had already been practically offset by new business. In the other towns their development was largely due to these lamps. They would notice that they held 29,490 ordinary shares and 8 820 preference shares in the Dumbarton Burgh and County Tramways Co., Ltd., and in the Hendon Co. they held 968 fully-paid shares, and 3,835 shares on which 10s. per share had been paid. In addition to their investment in the Dumbarton Tramway they supplied the company with current at a rate which gave a satisfactory profit. During the past year the revenue had benefited, but not to the full extent, from this source as the County Tramways had not been working the full year. For the same reason their net income was not augmented by any dividend on the £29,490 invested in the ordinary shares, from which, however, they hoped to ultimately receive a good dividend. They had a considerable holding in this company, and were represented on the board by Major Heaton Ellis, who reported encouragingly of the prospects of that undertaking. The company had recently effected a junction with the Glasgow Tramway system, thus making it possible to travel from Glasgow to Loch Lomond. With these improved facilities the company looked forward to a large increase in traffic from Glasgow with its enormous population. With regard to Hendon they would have the equivalent of 12,600 8-c.p. lamps connected to their mains. They considered this result of the first year's working of the company to be satisfactory. Hendon was London's newest and most popular suburb. It was opened up about two years ago by the introduction of the tube railway, and it was now being further developed by a line of tramways which would run right through the district. As Hendon was only five miles from Charing Cross, and the time occupied on the journey was only 18 minutes, the rapid development of the district was not surprising, and in the near future they should reap a substantial return from their holding in that company. The capital account showed that they had spent some £16,000 during the past year, and almost the whole of this had been devoted to Dumbarton, where they had had to put down additional generating plant to meet the demand of the tramway company. In the other towns the expenditure had been on mains and general development, and they might, with advantage, have gone further in this direction had they been able to do so. The revenue account was the most interesting feature, and he thought they would agree that it showed distinct progress. In this account they had not yet reaped the full benefit of their investments in the tramway company or in the Hendon Co. Turning to the net revenue account, he might explain that this had been drawn up in a somewhat different form to that which had been employed on previous occasions, because the auditors considered that they should bring into the account the figures in connection with the payments made by the auxiliary company. Owing to this change, the figures to compare with £401 (the balance shown in this account last year) did not appear. This year the figure was £2,397. The repairs and renewals fund showed a satisfactory balance after meeting all the repairs for the past year. This balance was due, of course, to the payments received from the guarantors, but it was interesting to note that the actual repairs and renewals were very much below the sum set aside for that purpose. Finally, with regard to the balance-sheet, he had drawn attention to the large amount owing to the bankers and others, which they proposed to pay off from the issue of further debentures. Then there was the item of reserve against investments. This represented the amount received by them as underwriters of a portion of the capital of the Dumbarton Tramways Co., and they had naturally placed this to reserve. The item of "sundry creditors" was practically balanced by the item for "sundry debtors" on the asset side of the sheet.

Major C. Heaton Ellis, in seconding the motion, remarked that as the company's representative on the board of the Dumbarton Tramways he could corroborate everything that the chairman had said in regard to that undertaking. He (the speaker) believed that they had got a good investment in that company. The

whole line was completed, and they only required the Board of Trade inspection which would take place within a few days, and the whole system would then be in operation. The directors also looked to the Glasgow tramways to bring them in a very considerable revenue.

The report was adopted.

On the motion of Mr. Francis R. Reeves, seconded by Sir Home Gordon, power was given to the board to borrow money to an extent not exceeding three-fourths of the issued capital.

Replying to a vote of thanks to the board,

Mr. K. A. Scott Moncrieff (chief engineer and general manager) said that with regard to the Hendon undertaking they had laid 12 miles of mains, and had 12,000 lamp connections. They had entered into negotiation for supplying the Hampstead Garden suburb. The progress of the Hendon undertaking was well maintained, and they had since added practically another 4,000 lamp connections.

Waste Heat and Gas Electrical Generating Stations, Ltd.

The second annual meeting was held on 17th inst. at Newcastle-on-Tyne. Mr. J. B. Simpson presided, and he said that the results they had already obtained might be considered very satisfactory, especially as the first two stations, where the capacity of the plant was about 10,600 H.P., had only been in working order for a part of the year, while the other two, where the capacity would be 4,600 H.P., were only now starting. They had already started to make a proper reserve fund out of the profits, for depreciation, &c. The agreements they had with the coke-oven and blast furnace owners were for fixed periods, generally 21 years; and although they expected to continue those agreements, yet the possible life of each agreement was being taken into account in making the reserve. By the time they reached the end of the agreements they hoped to have the whole cost of the stations written off, notwithstanding the fact that the turbines, dynamos, and other removable plant, would remain their property. The arrangements they made with the power companies were reduced to the simplest form; the latter took in bulk the whole of the power that each station was capable of turning out. They bore the cost of operating the stations, and kept them in proper repair; they paid a good rental for them, and also a price for the current produced. This company's expenses, therefore, were very few, which accounted for the good dividend of 7 per cent. they were able to declare. They were making a further issue of capital. They would require about £65,000 more to pay for the stations they had erected, and were erecting or taking an interest in. Of their £150,000 of authorised capital, £85,000 had already been privately subscribed. The chairman then moved the adoption of the report and accounts.

This was seconded by Mr. Newall, and carried. A dividend at the rate of 7 per cent. per annum was agreed to.

Mr. E. Lloyd Pease was re-elected a director, and Messrs. Monkhouse, Goddard & Co. were appointed auditors.

Baker Street and Waterloo Railway Co.

The twenty-first ordinary half-yearly meeting of this company was held on Thursday of last week at Hamilton House, Sir George S. Gibb presiding.

The Chairman, in moving the adoption of the report (see Electrical Review, February 19th, page 313), said that the accounts covered the fifth complete half-year since the opening of the railway. There had been a steady and continuous progress since the opening. In the first half-year ending December 31st, 1906, they carried 6,799,895 passengers, whilst last half-year they carried 13,337,126 passengers, an increase over the corresponding half-year of 25 per cent. The principle advance was in through bookings. The largest exchange was with the Central London Railway, with which upwards of 1,500,000 passengers had been exchanged; the next largest was with the Piccadilly Tube, and there nearly 1,500,000 passengers had been exchanged, and there were also large exchanges with the Metropolitan and the City and South London lines. The underground tubes had to be looked upon as a system of underground railway travel which they were endeavouring to develop, and it was by development without regard to boundaries of particular lines that each would benefit. The receipt per passenger travelling only on the Bakerloo line was 1·56d. The average received from through passengers was generally less, and the average over the whole worked out at 1·48d. per passenger. The working expenses showed an increase of £738. Less had been paid for current, and in the traffic expenses there was a considerable reduction amounting to £2,400. He thought the expenses might be regarded as settled at their normal figures. The financial result of the half-year was that £25,281 was available for dividend, and the directors recommended the declaration of a dividend of 4 per cent. on the preference shares and ¾ per cent. per annum on the ordinary shares, with an additional 2½ per cent. on the ordinary shares apart from those held by the Underground Electric Railway and that company's nominees. The dividend on the ordinary shares held by the public was at the rate of 3 per cent. per annum; £2,247 would be carried forward. Those dividends were provided out of the net revenue, and there was no need for any payment by the Underground Company such as was made in the December half-year, 1907. He thought it would be agreed that the accounts showed a satisfactory half-year's work. Referring to the Bill deposited in Parliament by the company, the chairman said they proposed to buy additional land at Oxford Circus so as to enlarge the station and provide additional lifts. Power was also taken to abandon some subway works in Trafalgar Square, authorised in 1905. At that time subways were in the fashion, and he was also afraid it was the fashion to impose burdens on tube companies. The general opinion now, he thought, was that subways were a waste of money, except in exceptional cases. They had had communication with the Westminster City Council on the subject of the Trafalgar Square subway, but the company had no reason to doubt but that some reasonable arrangement would be made with that body in regard to the matter. As they were aware, the North-West London Railway had an authorised railway from Cricklewood to Victoria, but second thoughts were sometimes best, and it had been decided to abandon the portion between Edgware Road and Victoria. The North-West London Co. proposed to make the portion between Edgware Road Station and Brondesbury practically as an extension of the Baker Street and Waterloo Railway, and a working agreement had been settled. The North-West Co. asked for no capital contribution from the Bakerloo, and they intended to make the line as an entirely independent scheme, and would provide the whole of the capital. Of course, if the line were made, it would modify the extension of the Baker Street and Waterloo Railway to Paddington, but he would not enter into details at that moment. They would have to have a special meeting of the shareholders to sanction the working agreement before it could go to Parliament.

Mr. Alfred Wills seconded the motion, and the report was adopted.

Subsequently an extraordinary general meeting was held, at which the new Bill was formally approved.

The Grand Berlin Tramway Co.

The report for 1908 of the Grosse Berliner Strassenbahn, after giving a detailed review of the development of the undertaking during the year, refers to the competition of the recently opened sections of the Elevated and Underground Railway and of the City Railway. Owing to this rivalry there was a decline in the tramway traffic towards the close of the year, although an increase is hoped for by an improvement in the general economic situation. The principal items from the accounts in the past two years are as follows:—

	1908.	1907.
Ordinary share capital... ...	£5,004,000	£5,004,000
Bonds (3½ and 4 per cent.) ...	211,500	277,000
Gross profits	874,831	845,927
Depreciation provision... ...	90,375	82,759
Local taxes	132,037	128,064
Renewal fund provision ...	133,000	116,750
Net profits	497,333	494,500
Profit share of municipality ...	44,466	31,481
Dividend, per cent.	8¼	8

The ordinary share capital has remained unchanged for several years, if not for the whole of the time which has elapsed since the conversion of the tramway system to electric traction was completed. On the other hand, the obligations or bonds, bearing a fixed rate of interest, have been gradually redeemed from over £400,000 in 1905 to £211,500 last year, and another period of four years should witness the extinction of this charge altogether. The number of passengers carried on the company's tramways in 1908 was 397,200,000 as compared with 378,200,000 in the preceding year. This is an increase of 5 per cent., whilst the passenger receipts advanced by over 15 per cent. The length of tramway, which comprised 323 miles of track at the beginning of 1908, was raised to 326 miles by the close of the year; and the rolling stock is composed of 1,491 motor-cars and 1,001 trailers. The report also contains particulars of the three suburban tramways in which the company is interested, and it is mentioned that the Grand Berlin Motor Omnibus Co. has not yet been able to fully meet the working expenses out of the traffic receipts, although an improvement is expected when the local authorities grant permission for the 'buses to frequent streets where the traffic is denser. In conclusion, the report states that the tramway company had 10,488 employés at the end of 1908 as contrasted with 10,391 at the close of the previous year.

Great Northern, Piccadilly and Brompton Railway Co.

Sir Geo. S. Gibb presided on Thursday last week at Hamilton House, Victoria Embankment, over the half-yearly meeting of the above company. In proposing the adoption of the report (see Electrical Review, February 19th, page 312), he congratulated the shareholders on the marked advance in the prosperity of the company. For their first completed half-year ending June, 1907, they carried 12,000,000 passengers, whilst last half-year the number was practically 17,000,000, or an increase of 5,000,000—the large percentage of 41½ per cent. The average receipt per passenger was 1·54d. Of the total traffic, 70 per cent. was local, and 30 per cent. was through traffic or exchange with other companies. The largest exchange was between the Piccadilly and Brompton Railway, which amounted to 1½ million passengers. They exchanged about 1½ million of passengers with the District Railway, and rather over one million with the Hampstead Tube. There was no doubt that the utility and convenience of underground railways depended upon the system being used as a whole, and they were endeavouring as much as they could to make the public

realise this. They wanted the public to get into the habit of using underground railways, and by so doing escape the irritating and hindering congestion of the streets. People were very apt to study maps, but often they were misleading, and in London very often the longest run was the shortest way. For instance, passengers could go from King's Cross to Waterloo in about 12 minutes; from Oxford Circus to Earl's Court in 14 minutes; and from Covent Garden to Edgware Road in about 10½ minutes. Last year they introduced strip tickets which were sold in packets at a saving in price to the public. The reductions in price varied from about 7 per cent. to 11 per cent., and the system greatly relieved the pressure on the booking offices. Their gross revenue was £143,235, an increase of 20 per cent. The train mileage showed an increase of 20½ per cent., and, of course, it was this which was the measure of public service. The working expenses amounted to £72,469; an increase of £1,716. The ratio of expenses to gross receipts was just over 50 per cent. The final result showed that the amount available for dividend was £30,549, and the directors recommended that this should be appropriated in the payment of the 4 per cent. preference dividend, of a dividend of ⅝ per cent. on the ordinary shares, and that £5,859 be carried forward to the next half-year. The special feature in London during last half-year had been the Franco-British Exhibition, and it was really curious to notice the widespread effects. He noticed that several of the chairmen of the trunk lines had referred to the substantial increase in long-distance traffic owing to the exhibition. The exhibition had not affected their line very much, but they had the satisfaction of knowing that if they did not gain much they also had little to lose from such a source in the future. The question used to be asked, "Will you pay your debenture interest?" and now the question asked was, "What dividend will you be able to pay?" He could answer both questions satisfactorily. The debenture interest was well assured, and the dividend would be an increasing one. They were still a very young concern, having only completed the second year of their existence, and they must remember that they were engaged in pioneer work. The tube opened up an entirely new route, and formed part of what one might describe as a new system of underground railway travelling. They could not expect a full traffic immediately, but they offered a convenient train service, and must simply wait for development. Fortunately they had not had long to wait for the initial stages of success, and at the end of each half-year they had seen a substantial growth in their revenue, which he had no doubt their future accounts would continue to exhibit.

LORD GEO. HAMILTON seconded the motion, and the report was adopted without discussion.

British Electric Transformer Co., Ltd.

THE directors' report and statement of accounts for the year ending December 31st, 1908, to be presented at the annual general meeting, to be held at Salisbury House on March 2nd, show that after paying all manufacturing costs and the expenses of administration, there remains a net profit of £11,525 15s 7d., which, with the amount brought forward from last year, viz., £34 12s., makes a total available balance of £11,563 7s. 7d. The board recommend that this balance shall be allocated as follows:—To reserve account, £3,000; to preliminary expenses written off, £1,266 13s. 9d.; to payment of preference dividend of 6 per cent. for two years ended December 31st, 1908, £3,747 19s. 7d.; to payment of a dividend of 3½ per cent. on the ordinary shares, £2,428 19s. 4d.; to carry forward a balance of £1,119 14s. 11d. Mr. A. F. Berry, the retiring director, being eligible, and the auditors, Messrs. Monkhouse, Stoneham & Co., offer themselves for re-election.

Notting Hill Electric Lighting Co., Ltd.

THE nineteenth annual report of the directors, to be submitted to the ordinary general meeting at Winchester House on March 2nd, shows that the expenditure on capital account at the date of the last balance-sheet stood at £233,526 13s. 4d.; it has been increased during the past year by £4,215 19s. 11d., and now stands at £237,742 13s. 3d. The expenditure on capital account exceeds the receipts by £29,742 13s. 3d. The cost of the joint station to date has amounted to £213,287 16s. 1d., and joint debenture stock amounting to £232,000 has been issued. This stock is subject to a cumulative sinking fund, which now amounts to £29,312 0s. 10d. invested in trustee securities. The following table shows the progress of the company:—

	Equivalent of		
1904 ...	8-c.p. lamps 132,132 ...	Profit ...	£19,890 9 5
1905 ...	do. 143,102 ...	do. ...	19,983 12 7
1906 ...	do. 153,525 ...	do. ...	20,038 14 8
1907 ...	do. 160,349 ...	do. ...	19,007 11 9
1908 ...	do. 168,885 ...	do. ...	19,484 5 7

The number of consumers is now 2,846, and over 98 per cent. of these are supplied at 200 volts. The gross revenue for the year was £38,902 7s. 7d., showing an increase of £847, and the total net profit was £19,484 5s. 7d., from which have to be deducted the following sums:—Depreciation, renewal and reserve fund, £2,300; debenture and other interest, £2,612 0s. 4d.; Kensington and Notting Hill joint debenture stock—interest, £2,365 14s. 7d.; sinking fund, £1,293 6s. 2d.; leaving a balance available for dividend of £10,908 4s. 6d. The directors recommend that this be appropriated in payment of the usual dividend of 6 per cent. (less income-tax) on both the preference and ordinary shares, and that the balance be divided in accordance with the articles of association, one-half being credited to the founders' shares and the other half to the ordinary and preference shares. This will enable a further 1 per cent. to be paid on both ordinary and preference, with a distribution of £3 per share on the founders' shares. An interim dividend of 3 per cent. was paid to the holders of the ordinary shares on July 1st, and the balance of 4 per cent. will be paid forthwith, together with the distribution on the founders' shares. The preference shares having received their full 6 per cent., the 1 per cent. bonus will be added to the interim dividend on these shares, to be paid on July 1st next. The rates paid to the local authorities (including this company's proportion of those charged in the Wood Lane accounts) amounted to over £3,400, being equivalent to a dividend of nearly 2½ per cent. on the share capital. The directors retiring in rotation are Sir Joseph W. Swan, F.R.S., and Mr. Arthur E. Franklin, J.P., who, being eligible, offer themselves for re-election. The shareholders' auditors, Messrs. Fox, Sissons & Co., also offer themselves for re-election.

South Metropolitan Electric Light and Power Co., Ltd.

THE report of the directors for the year 1908, to be presented at the ordinary general meeting at Winchester House on March 1st, shows a credit balance of £26,975 13s. 9d., which, with £7,182 13s. 2d. the balance brought forward from the last account, makes a total of £34,158 6s. 11d. After deducting £10,790 3s. 7d. for interest on debenture stock paid and accrued, and for other interest, and £5,003 17s. 7d. for interim dividend paid on the 7 per cent. cumulative first preference shares, there remains a balance of £18,364 5s. 9d., which the directors recommend be dealt with as follows:—To payment of final dividend to December 31st, 1908, upon the 7 per cent. cumulative first preference shares, £5,003 17s. 7d.; to credit of depreciation account (which with the £5,000 transferred from the reserve account will make a total of £6,500), £1,500; to credit of preliminary expenses, £1,500; to suspense account, £792 11s. 6d.; to payment of dividend to December 31st, 1908, upon the ordinary shares at the rate of 2½ per cent. per annum, £3 075; and that the balance of £6,492 16s. 8d. be carried forward to the next account. The following comparative figures show the progress of the company's business:—

Year.	8-c.p. (35 watt) lamps. Connected at end of year.	Increase.	No. of consumers.	Gross revenue.	Expenditure.	Net revenue.
				£ s. d.	£ s. d.	£ s. d.
1904* ..	108,391	17,851	2,555	28,796 16 6	12,222 0 3	16,574 16 3
1905 ..	125,674	17,283	2,858	35,421 13 11	13,290 4 7	22,131 9 4
1906 ..	144,712	19,038	3,201	38 244 13 6	14,125 15 10	24,118 17 8
1907 ..	160,380	15,668	3,383	43.302 9 5	16 284 10 3	27,067 19 2
1908 ..	177,628	17,248	3,649	42,953 11 2	15,977 17 5	26,975 13 9

* Including Crystal Palace Co.'s area from June 16th, 1904

The increase in lamp connections and new consumers has been well maintained, but the revenue has not kept pace with the additional business, owing to the introduction of the new metallic-filament lamps. As the use of these lamps reduces the cost of the light it is anticipated that the company will eventually benefit by an entirely new demand from residents in thickly populated districts hitherto untouched, and from owners and occupiers of large estates now in course of development.

The director retiring in rotation is Mr. H. St. John Winkworth, who is eligible, and offers himself for re-election.

Messrs. Chalmers, Wade & Co., the auditors, offer themselves for re-election.

Charing Cross, West End and City Electricity Supply Co., Ltd.

THE annual general meeting was held on February 18th at the offices, 60, St. Martin's Lane, Mr. W. F. Fladgate presiding.

The CHAIRMAN, in moving the adoption of the report (see ELECTRICAL REVIEW, February 12th, page 268) congratulated the shareholders upon the continued progress and prosperity of the company. The only unsatisfactory feature in the accounts was the item of coal, and that did not arise from the fact that there had been any extravagance of consumption upon their part, but entirely from the circumstances that they had had to pay more for the coal. As a matter of fact, there had been a saving in the coal consumed at Bow, which was their principal station, as compared with the corresponding year of 1907; but, on the other hand, there had been an advance of 10½ per cent. in the cost of the coal. This was partly due to the fact that the price of coal had been higher, and partly to the fact that during last year they had the remainder of a large stock of coal which they bought in consequence of the possibility of a coal strike, and which cost a higher price. The working of the business had shown very satisfactory results, the gross receipts for the year 1908 of the West End undertaking having been £139,253, as against £131,920 for the previous year, or a gross increase of £7,333. The result of the working of the West End undertaking was that they were able to pay the ordinary shareholders a 5 per cent. dividend for the whole year, and to carry forward £5,163. With respect to the City undertaking, they showed a gross revenue of £131,012, as against £118,543 for the

previous year, and after payment of the preference dividend they had a balance to carry forward of £5,110, as against £2,256. Dealing with the question of lamps, he said that the connections which had been made during the past year in the West End amounted to 40,528 lamps, against 28,375 lamps in the preceding year. The total connections in all amounted to 579,492, of which a large amount was for power. They had made arrangements with the London County Council, under which they were supplying them with a bulk supply for the lighting of the Victoria Embankment. The progress of the City undertaking had again been quite satisfactory. There was an increase in the lamps of over 40,000 compared with last year's figures, of which they were supplying an equivalent of 6,781 H.P. as motor power. They had also arranged to give a bulk supply to the Smithfield Markets Electric Lighting Co. The chairman then dealt with the other items of the accounts, and pointed out that the figures for practical purposes, with the exception of coal, were as near as possible the same as for the previous year, notwithstanding that the sales of current had very largely increased. Referring to the future, he said that the outlook was distinctly hopeful. The prospects were better as regarded coal, and he looked forward with every confidence. He dealt at length with the difficulties which the electric lighting industry had had to suffer from during the past four years in consequence of adverse legislation, and the endeavour to pass Bills which would have been inimical to the interests of this and the other companies. He was glad to think that the cloud which had overhung the industry had now been entirely dissipated, and that there was no chance of any further adverse legislation. He reviewed the circumstances of the past four years, and explained the work which he, in common with other directors of other companies, had done in protecting the company's interests and those of the shareholders. He remarked that it was not their intention to renew the lease of the Lambeth station, but to utilise the plant there at their station at Bow, and the substations. In conclusion, he paid a high tribute of praise to the services which had been rendered by the whole of the staff in furthering the interests of the shareholders.

MR. G. H. BROUGHAM GLASIER seconded the resolution, which was unanimously carried without discussion.

The CHAIRMAN then proposed the payment of a dividend of 4½ per cent. for the year 1908 on the cumulative preference shares of the West-End undertaking, and the payment of a dividend at the rate of 5 per cent. per annum for the half-year ending December 31st last, making with the interim dividend paid in August, 5 per cent. for the whole year on the ordinary share capital of the West-End undertaking. This was unanimously agreed to.

The other formal business having been transacted,

MR. BAIN said the directors of this company were receiving a much smaller amount of remuneration for their services than the directors of any other electric lighting companies in London, and this despite the fact of the excellent results they showed, and the enormous capital of the company. They were only receiving 1,500 guineas per annum, and he felt that he would have the approval of the meeting when he proposed that the amount of their remuneration for this year should be increased to the sum of 2,500 guineas.

The resolution was seconded, and unanimously carried, and a cordial vote of thanks to the chairman, directors, and executive closed the meeting.

Ascot District Gas and Electricity Co., Ltd.

THE meeting of this company was held on Tuesday at the offices, 50, Cannon Street, Mr. Joseph Mainwaring presiding.

In moving the adoption of the report, the CHAIRMAN said that the past year was one which had marked a new era in the history of the company, and one to which some of them, who might call themselves veterans in the gas world, must have looked forward with a degree of anxiety, though he was pleased to say without undue concern, as they felt sure that the step they had taken in the interests of the company in applying for powers to supply electricity was a step which was bound eventually to lead to greater prosperity. They occupied the position of being the first gas company (in England, Eds. E.R.) which was able to present to its shareholders revenue accounts for gas and electricity for a whole year on the same sheet. At first their friends shook their heads doubtfully as to the expediency of their embarking on this undertaking, but if they might regard imitation as being the sincerest form of flattery, there were to-day at least two other companies who were applying for similar powers. The past year had not been considered a favourable one for gas companies generally; the weather had been illusive, and other circumstances had combined to retard the progress of the output; and whilst they might have expected some diminution in the sale of their gas, they had, as a matter of fact, such a very small reduction to record that it was hardly worth while noticing; but if they took the gas and electricity combined, they had an increase in the joint undertaking of £500. The past year had borne the whole brunt of the increased price of coal, amounting to about 11 per cent. more than the previous year. The management expenses had this year been divided up between gas and electricity, not in proportion to the business done, but in proportion to the capital expended. Under this arrangement the gas department had been relieved of about £250, which charge was borne by the electricity department. Of the electricity revenue amounting to £609, £436 was for the latter half of the year and £173 for the former half, and owing to the management charge the account showed a loss of £97 to June 30th, 1908, and a profit of £129 for the latter half of the year, resulting in a small profit for the year of £32. The standing charges therefore being at their maximum, all increase in the yield of current would result in a far greater proportion of profit, and he was very hopeful that next year they would be able to report a net profit which would bear a reasonable proportion to the capital expended. In conclusion, he congratulated the shareholders upon the success with which the company had turned the corner, and the evident signs it showed of being on the path to greater prosperity in the future.

MR. ALFRED KITT, in seconding the resolution, said he felt sure that in the future the electricity department would show much larger profits.

Replying to questions, the SECRETARY said that the company had installed an equivalent of 5,486 8-C.P. lamps, and had another 1,000 in contemplation or preparation. At present they had 14¼ miles of main cable laid.

MR. A. E. BROOKS, the engineer, mentioned that the maximum output as yet had been 35·4 KW. They had two machines and all the necessary plant to produce 50 KW. each, so it would be seen that the additional expenditure would be comparatively small for a long time to come.

The report was adopted.

Simplex Conduits, Ltd.

THE directors in their third annual report and balance-sheet (which they consider satisfactory) say that the stock has been inspected by them, and they certify as to its satisfactory condition and value. The profits of the year, after providing for bad and doubtful debts, amount, with interest on investments and transfer fees, to £12,922, and after charging directors' fees, depreciation and income-tax, £2,444, and adding the amount brought forward from last year, £2,654, there remains for disposal £13,132. This the directors propose to appropriate as follows:—

Half-year's preference dividend of 6 per cent., less income-tax, to June 30th, 1908, already paid, £1,140; half-year's dividend on the ordinary shares at 7½ per cent. per annum to June 30th, 1908, already paid, £1,500; half-year's preference dividend of 6 per cent. per annum to December 31st, 1908, including dividend on new issue, from the date of payment of instalments to December 31st, 1908, already paid, £1,244; half-year's dividend on the ordinary shares at 12½ per cent. per annum, making with the 7½ per cent. already paid 10 per cent. for the year, £2,500; carrying to reserve fund £4,000 (making that fund £9,500), and carrying forward £2,748.

The third annual general meeting of the company was held at the offices, Garrison Lane, Birmingham. Mr. Henry Huggins, presided, and in moving the adoption of the above report, he referred to the fact that the balance-sheet was of a satisfactory nature, in spite of the widespread depression in trade prevalent during 1908. Out of the £13,132, the preference dividend at the rate of 6 per cent. per annum on 8,000 shares for the year absorbed £2,280, paid in two instalments (dividend on new issue of 2,000 preference shares from date of instalments, £104), and interim dividend on ordinary shares to June 30th, 1908, at the rate of 7½ per annum, absorbs £15,000. £4,000 was again carried forward to reserve fund, and after paying dividends on the ordinary shares, making 10 per cent. for the year, £2,748 was carried forward. Messrs. Harrison, West, Ledsam & Co., chartered accountants, were re-elected auditors for the new year, and Messrs. Alex. Smith & Son were re-elected to make a valuation on the leasehold buildings, plant, machinery and tools, for the year ending December 31st, 1909. The proceedings closed with a hearty vote of thanks to the staff of the company.

Newcastle-on-Tyne Electric Supply Co.—An extraordinary general meeting was held in Newcastle on 18th inst., Dr. Merz presiding, to consider a resolution approving the County of Durham Electric Supply Co.'s Bill. The Chairman explained that the companies were allied. The Newcastle Co. supplied all the energy required by the Durham Co., and they were, therefore, interested in the arrangements which the Durham Co. might think fit to make. He pointed out that the Bill conferred no obligation on the Newcastle Co., it only gave them certain optional, permissive rights, which they could exercise or not. Something similar had already been carried out and approved by Parliament. —A shareholder said it appeared to him that the company was getting too large. The shares had fallen to 3⅞. Perhaps the chairman would give some explanation why they had fallen.—Another shareholder said it appeared to him that it was not an opportune time to submit such a proposal.—The chairman said there was no obligation on them to exercise any of the rights they would obtain by the Bill. He did not think that the fact that the Durham Co. was the largest customer had anything to do with the fall in the value of the shares.—A resolution approving of the Bill was carried by 24 votes to 5.

Companies Struck off the Register.—The following companies have been struck off the register and are dissolved:—

Brunè-Turchi Telegraphic Co., Ltd.
Corporation for Promoting British Trade Abroad, Ltd.
Electrical Engineering Co. of London, Ltd.

Bournemouth and Poole Electricity Supply Co.—A final dividend on the ordinary shares at the rate of 7 per cent. per annum for the half-year ended December 31st, making 6 per cent. for the year, less tax, is recommended. Last year the ordinary dividend was 7 per cent.

ELECTRIC TRAMWAY AND RAILWAY TRAFFIC RETURNS.

Locality.	Fortnight ended.	Receipts for the fortnight. £	Receipts for the fortnight. £*	No. of wks.	Total to date. £	Total to date. £*	Route miles open.	Inc.
Aberdeen	Feb. 17	2,336	— 15	38	52,781	— 90	..	..
Ayr	,, 20	355	— 16	40	11,917	— 258	8	..
Bath	,, 17	1,152	+ 16	7	4.161	+ 254	..	..
Belfast	,, 19	6,921	— 119	47	170,832	+ 421	37	..
Birkenhead	,, 21	1,927	+ 10	47	49,751	+ 600	13·52	..
Birmingham Corp.	,, 18	12,559	— 27	46	292,645	+ 7,588	..	..
Blackpool-Fleetw'd	,, 20	448	+ 38	7	1,674	+ 198	..	..
Bolton	,, 21	4.224	— 48	47	107 515	+ 1,601	26	..
Bournemouth	,, 17	2.478	— 147	46	74,460	— 3,486	21·96	..
Bradford	,, 18	8,396	— 127	45	211,731	+ 607	54·9	..
Brighton	,, 21	1.348	— 4	46	42,233	+ 1,007	9·5	..
Bristol	,, 19	9,436	+ 359	..	..	..	..	..
Brit. Elec. Trac. Co.								
Airdrie	,, 12	485	— 1	6	1,383	+ 15	3·65	..
Barnsley	,, 12	324	— 9	,,	972	+ 8	..	..
Barrow	,, 12	898	— 14	,,	1,192	— 66	5 37	..
Cavehill	,, 12	109	— 14	,,	320	— 22	..	..
Devonport	,, 12	5 8	— 89	,,	2,483	— 55	8·85	..
Gateshead	,, 12	1,941	— 45	,,	5,865	— 47	11 25	..
Gravesend	,, 12	340	— 32	,,	1,053	— 63	6·5	..
Greenock	,, 12	882	— 67	,,	2,619	— 109	7·25	..
Hartlepool	,, 12	376	— 60	,,	1,189	— 163	6 72	..
Kidderminster	,, 12	151	— 9	,,	473	— 18	..	..
Leamington	,, 12	259	+ 10	,,	839	+ 85	..	..
Merthyr	,, 12	385	+ 1	,,	1,188	+ 36	2·9	..
Metropolitan	,, 12	10,4?2	+ 918	,,	32,119	+ 4,194	22	..
Middleton	,, 12	562	— 56	,,	1,196	— 45	8·5	..
Mid. Joint Com'tee	,, 12	10,478	— 6.6	,,	..	..	..	..
Oldham—Ashton	,, 12	1,037	— 87	,,	3,106	— 181	9·13	..
Peterborough	,, 12	184	— 17	,,	559	— 46	5·31	..
Potteries	,, 12	3,380	— 45	,,	10,398	— 510	29	..
Rothesay	,, 12	76	— 22	,,	267	— 8	2·75	..
Southport	,, 12	425	+ 19	,,	1.331	+ 155	8·17	..
S. Metropolitan	,, 12	1,279	— 26	,,	4,015	+ 189	..	..
Swansea	,, 12	1,671	— 12	,,	5,170	+ 224	12·5	..
Tynemouth	,, 12	241	— 27	,,	763	— 87	3·75	..
Weston-s-Mare	,, 12	46	— 1	,,	160	+ 10	3	..
‡Worcester	,, 12	4?6	— 34	,,	1,396	+ 6	5·75	..
Wrexham	,, 12	172	— 6	,,	534	+ 12	..	..
Yorks. Wool. Dist.	,, 12	1,688	— 5	,,	5,079	— 3	17	..
Miscellaneous	,, 12	357	— 6	,,	1,078	— 19	..	..
Burnley	,, 20	2,258	+ 80	..	..	..	..	..
Burton-on-Trent	,, 21	1?2	— 23	47	12,477	— 671	10	..
Bury	,, 21	2,049	— 35	46?	53,515	+ 1,728	..	..
Cardiff	,, 20	3,747	— 67	47	100,107	+ 862	..	..
†Carlisle	,, 2	154	— 1	52	9,210	— 34	..	..
Chatham and Dist.	,, 18	1,373	+ 171	7	4.915	+ 614	14·98	2·77
Cork	,, 18	776	+ 8	7	2,288	+ 105	9 9	..
Croydon	,, 12	2,443	+ 16	46	68,8?2	— 240	11·25	·75
Darlington	,, 20	357	— 33	47	9,149	— 725	..	..
Darwen	,, 19	448	..	46	11,516	— 314	4·36	..
Dover	,, 18	281	— 4	46	9,677	— 423	4 75	..
Dublin	,, 19	9,481	— 87	..	34,581	+ 941	54·25	..
Dundee	,, 17	2,272	+ 60	39?	47,699	+ 1,9.0	14·5	..
East Ham	,, 20	1,695	+ 125	47	41,336	— 583	8·43	·68
Exeter	,, 19	499	+ 26	47	14,5.0	+ 367	5·5	..
Glasgow	,, 20	32 558	— 594	..	640,660	—11,202	90·5	1·5
Hastings	,, 18	1,401	— 59	..	..	..	..	..
Huddersfield	,, 20	2,851	+ 62	47	78,721	— 803	28·5	·5
Hull	,, 20	4,885	+ 124	47	115,679	— 298	13	..
Ilkeston	,, 17	239	— 12	46	6,355	— 1?8	3·5	..
Ipswich	,, 20	581	— 22	47	17,986	— 309	10·5	..
Kilmarnock	,, 13	273	— 10	39	5,940	— 263	4·26	..
Lan'kshire Trm Co.	,, 18	2,313	+ 145	7	8,618	— 529	17	1·18
Lancashire United	,, 17	2,331	+ 31	7	8 031	+ 321	89	1
Leeds	,, 18	12,179	— 63	43	80,003	+ 355	96·75	·25
Leicester	,, 20	4.035	— 102	..	..	..	..	..
Leith	,, 18	926	+ 17	39	20,646	+ 76	6	..
Liverpool	,, 13	20.556	— 118	69	65,479	+ 1,665	104	..
†‡L.C.C.	,, 6	33,640	+ 3,940	..	1,560,319	+172,4?8	121	4·25
London United	,, 20	9,097	— 829	..	35,?82	— 1,?96	..	..
†Lowestoft	,, 18	123	— 16	20	2,962	— 239	3·5	..
Manchester	,, 20	27,633	+ 114	47	700. ?8	+16,876	90·5	6
Newcastle	,, 20	7,420	— 42	47	182,542	— 8,603	..	..
†Newport	,, 13	559	— 6	46	29.813	— 1,10?	14·5	..
Oldham	,, 21	3,610	+ 28	48	89,559	— 832	23·76	..
Pontypridd	,, 18	726	+ 127	46	17,474	+ 4,800	5·5	1·75
Portsmouth	,, 12	3,074	+ 284	46	89,882	+ 1,485	14·5	..
Preston	,, 17	1,881	+ 3	..	..	..	..	..
†Reading	Jan. 14	1,470	+ 104	41	25,998	+ 11	18·25	..
Rotherham	Feb. 18	1,198	— 40	46?	28,218	— 90	10	·66
Salford	,, 15	8,322	— 286	45	211,?84	— 3,406	87	1·25
Sheffield	,, 21	10 641	+ 134	47½	262,902	— 3,406	87	1·25
Southampton	,, 17	1,778	..	46	48 959	+ 1,?98	..	..
Southend-on-Sea	,, 10	571	+ 55	47	20,268	+ 2,012	..	..
South Shields	,, 20	?88	+ 24	..	26,083	— 251	4·4	..
†Swindon	,, 17	1?1	— 27	..	..	..	..	..
Tyneside	,, 17	754	+ 29	7	2,564	+ 7	8·67	..
Wallasey	,, 18	1,573	+ 134	45½	40.433	+ 2,363	8·72	·22
‡Walthamstow	,, 18	481	— 4	46	28,580	+ 1,423	9	..
West Ham	,, 11	4 090	— 41	46	101.090	— 4,248	15	·3
Wolverhampton	,, 17	1,482	— 69	46	38,040	— 1,198	13·5	..
Baker St.-Waterloo	,, 20	6.805	+ 835	7	24 C85	+ 2,495	4·25	..
Cen. London Rly.	,, 20	11,0?6	— 779	7	39,524	— 3,462	..	..
Char. +, Eus. Hamp.	,, 20	7,6?5	+1,575	7	26,9?0	+ 4,995	7.75	..
City & S. Lon. Rly.	,, 21	6 650	+ 201	7	23,8?9	+ 201	7·2	..
Dublin-Lucan Rly.	,, 19	2?8	+ 23	7	762	+ 76	7	..
G.N. and City Rly.	,, 20	3 189	— 884	7	11,20?	— 1,682	3·6	..
G.N., P'dy. & Ermin.	,, 20	11,725	+1,305	7	41,375	+ 3,760	9·25	..
L'pool Overh'd Rly.	,, 21	2 507	— 891	7	10,5?3	— 491	6·8	4·6
Mersey Railway	,, 20	3,868	+ 178	7	18,759	— 582	4·5	..
Metropolitan Rly.	,, 21	81,368	+1 398	7	111,691	+ 4.121	24·5	..
Met. District Rly.	,, 20	19,?31	+2,288	7	6?,062	+ 6,4?2	24	..
Anglo-Argentine	,,	52.7.5	+16,862	7	182,?99	57,797	..	..
Bombay (B.E.T.)	Jan. 21	5,031	+ 1 6	3	7,?41	+ 833	..	..
‡Brisbane	,,	15.8?0	+ 1,020	..	..	..	..	..
Calcutta	Feb. 20	6.?57	+ 471	..	..	..	..	..
‡Geneva	Jan.	?,887	+ 6?4	..	..	..	..	..
Mexican	Feb. 15	1 ?96	+ 26	..	4,185	+ 170	..	..
Perth (W.A.)	,, 19	2,942	+ 65	7	10,883	+ 2?8	..	..

* Compared with the corresponding period of 1908. † One week only.
‡ Includes horse, steam and other receipts. § One month.

STOCKS AND SHARES.

Tuesday Afternoon.

Foreign politics have once more moved into the immediate horizon of finance, and obscured the returning confidence which was previously noticeable in certain of the markets. The Near Eastern question has become more acute, and Stock Exchange prices hang upon the news from Vienna, Belgrade, St. Petersburg and other such disseminating centres of all that is truthful and accurate. The recent rise which took Consols up to 85¼ is all over, for the time being, and the Funds languish, as we write, at a little under 84 again.

Small wonder is it, then, that dull markets and depressed prices have in most cases to be recorded. There is even a pause in the appetite for new issues.

Of these, the Winnipeg Electric is one of the most interesting in its own class. The opinion was expressed that it just missed the tide of buoyancy which would have carried the emission off with great success. Coming out at the time when Rio Trams were very flat and the Mexican-Canadian group as a whole by no means happy, the Winnipeg Electric chanced upon what might have been an unlucky moment. But in point of fact, the issue was highly successful, and was covered several times. The new La Plata prospectus deserves attention if only for its extreme frankness.

Rio de Janeiro Trams collapsed in one day from 101 to 95, in consequence of the new issue of capital foreshadowed here last week. At the same time the Belgium financial trouble was declared to be at a critical stage. This Brussels business is so vague, and yet so much pressed into service as a factor, that Betsy Prig's historic announcement to Mrs. Gamp on the subject of Mrs. Harris may well be recalled. At any rate, the price bounded up again to 100, only to ease off to 98½, while the 5 per cent. gold bonds are a little lower at 94.

Mexico Trams shed 5½ points to 136, and then recovered 1½, while the bonds kept steady at 94. Sao Paulo Trams at 161 show a small decline. In the power group, Mexican Light Common shares are down further, and the bonds and Preference stock are both lower. Last week's meeting at Montreal was a tame affair after all, and the result had no effect upon prices, which have been swayed by speculation more than anything else. Mexican Electric Light 5 per cent. First Mortgage bonds lost their last week's rise, and a point extra into the bargain.

Shawinigan Water and Power capital stock fell 6½ to 97, Canadian General Electric 1 to 114, and Electrical Development of Canada bonds weakened to 86.

Although Rio Trams reacted so sharply, Anglo-Argentines are strong, and the Second Preference shares have again risen above 9. Tramway issues other than those already quoted are steady. London United Tramways Debenture stock at 73 shows a gain of 2. British Electric Tractions are unaltered. British Westinghouse Preference eased off to 8s. 9d., and the 4 per cent. debenture stock is marked a point lower, the 6 per cent. prior lien remaining about 96½.

Home Railway stocks gave indications of general improvement until within the last few days, when the weakness of Consols infected the Home Railway department too. Central London Ordinary, however, regained 2 per cent., so that the dividend is more than recovered. City and South London Ordinary held its rise. Both Metropolitan Consolidated and District Ordinary have given way to a slight extent.

The Metropolitan Electric has declared a dividend at the rate of 6 per cent., making 5½ per cent. for the year, the County of London dividend of 5 per cent. makes 5 per cent. for the year, and the Notting Hill Co. has issued a fair report. Prices of Metropolitan Electric Supply issues, however, are entirely without feature. There is a little demand for the best class debenture stocks, and this resulted in two or three being quoted a point better, but so far as the shares of the companies are concerned the market is dormant. Amongst the provincial undertakings, Folkestone Ordinary are ¼ down, and Newcastle-on-Tyne shares show no recovery after their heavy fall.

Telegraph descriptions are also uninteresting. The Anglo-American varities are affected to a small degree by the flatness of American Railroad shares caused by the uncertain outlook for the price of copper and steel, and the fall which has lately taken place in the price of the metals. American Telephone and Telegraph shares came to market, and lost 2, with other American issues. West Coast of America shed ⅛ of the recent rise, and Indo-European Telegraphs are £1 down. The Trust companies' shares exhibit no movement.

Henley's rise of last week is explained by the issue of an excellent report, telling of good progress, and the price stays at 12½. Telegraph Constructions replaced their fall of a week ago, in spite of the reduction in the dividend from 17½ to 15 per cent. Crompton's fell ½, and other manufacturing shares are quiet.

SHARE LIST OF ELECTRICAL COMPANIES.

TELEGRAPH AND TELEPHONE COMPANIES.

Present Issue.	NAME.	Stock or Share. *	Dividends for the last four years. 1905.	1906.	1907.	1908.	Closing Quotations Feb. 16th.	Closing Quotations Feb. 23rd.	Business done week ended Feb. 23rd, 1909. Highest.	Lowest.	Rise + or Fall −	Present Yield per cent. £ s. d.
25,000	Amason Telegraph Co.'s shares, Nos. 1 to 25,000	10	Nil	Nil	Nil	..	2⅛ — 3⅛	2⅛ — 3⅛	..	..	..	Nil.
136,700	Do. do. 5 % Debs., Nos. 1 to 1,250 Red.	100	5 %	5 %	5 %	5 %	92 — 95	92 — 95	..	..	..	5 3 1
$131,551,400	American Telephone & Telegraph, Cap. Stock ..	$100	7½%	8 %	8 %	..	132 —128	130 —131	132½	..	—2	6 2 2
$58,000,000	Do. Collat. Trust, 4% Bonds, 1 to 28,000 and 53,001 to 78,000	$1000	4 %	4 %	4 %	4 %	95 — 97	95 — 97	..	..	..	4 2 8
598,180	Anglo-American Telegraph	Stock	3½%	3½%	3½%	£3 4s.	55 — 58 xd	55 — 58	..	..	..	5 5 3
8,200,910	Do. do. do. 6 % Pref.	Stock	6 %	6 %	6 %	6 %	99 —101 xd	99 —101	100½	99	..	5 18 10
8,200,910	Do. do. do. Deferred	Stock	½%	1½%	1 %	8/-	13½ — 14	13½ — 13¾	13⅝	13 3/16	— ¼	2 17 4
50,000	Anglo-Portuguese Tel., 5 % Mort. Deb. Stock Red.	100	5 %	5 %	5 %	5 %	100 —102	100 —102	..	..	..	4 18 0
44,000	Chili Telephone, Nos. 1 to 44,000	5	8 %	8 %	8 %	..	7⅞ — 8⅛	7⅞ — 8⅛	..	..	..	4 15 6
2,431,320	Commercial Cable Sting. 500 year 4 % Deb. Stk. Red.	Stock	4 %	4 %	4 %	4 %	85 — 87	84⅜ — 86½	85⅞	..	..	4 12 6
16,000	Cuba Telegraph	10	5 %	5 %	6 %	..	8 — 9	8 — 9	..	..	..	6 13 4
6,000	Do. 10 % Pref.	10	10 %	10 %	10 %	10 %	16½ — 17½	16½ — 17½	..	..	..	5 14 3
12,931	Direct Spanish Telegraph, Ord.	5	4 %	4 %	4 %	..	3 — 3½	3 — 3½	..	..	..	5 14 3
6,000	Do. do. 10 % Cum. Pref.	5	10 %	10 %	10 %	..	8 — 9	8 — 9	..	..	..	5 8 1
30,000	Do. do. 4½ % Debs.	50	4½%	4½%	4½%	4½%	99 —102	99 —102	..	..	..	3 16 6
60,710	Direct United States Cable	20	4½%	4½%	4½%	4½%	12¾ — 13¾	12¾ — 12¾	..	..	..	6 9 3
53,700	Direct W. India Cable, 4½ % Reg. Deb., 1 to 1,200, R.	100	4½%	4½%	4½%	4½%	99½ —101½	99½ —101½	..	..	..	4 8 8
4,000,000	Eastern Telegraph, Ord. Stock..	Stock	7 %	7 %	7 %	..	128 —131	128 —131	129½	128	..	5 6 10
2,000,000	Do. 8½ % Pref. Stock..	100	8½%	8½%	8½%	..	84½ — 86½	84½ — 86½	86	85	..	4 0 11
1,896,706	Do. 4 % Mort. Deb. Stock. Red. ..	Stock	4 %	4 %	4 %	4 %	103½ —105½	103½ —105½	..	..	..	3 17 8
800,000	Eastern Extension, Australasia, and China Tele.	10	7 %	7 %	7 %	..	11¼ — 12⅜	11¼ — 12⅜	12⅜	12 1/16	..	5 13 2
752,400	Do. 4 % Deb. Stock	Stock	4 %	4 %	4 %	4 %	100 —102	100 —102	..	..	..	3 18 5
200,000	East & S. Afric. Tel., 4 % Mt. Db. (Mauritius Sub.) 1 to 8,000	25	4 %	4 %	4 %	4 %	100½ —102½	100½ —102½	..	..	..	3 18 1
181,127	Globe Telegraph and Trust	10	5½%	5½%	5½%	..	10½ — 10⅝	10½ — 10⅝	10⅝	..	..	5 10 11
181,127	Do. do. 6 % Pref..	10	6 %	6 %	6 %	..	13 — 13½	13 — 13½	13 3/16	13 3/32	..	4 8 11
150,000	Great Northern Telegraph, of Copenhagen.. ..	10	24%	20 %	20 %	..	30 — 32	30 — 32	..	..	..	6 5 0
24,300	Halifax and Bermudas Cable, 4½ % 1st Mort. Debs., within Nos. 1 to 1,200, Red.	100	4½%	4½%	4½%	4½%	99½ —101½	99½ —101½	..	..	..	4 8 8
17,000	Indo-European Telegraph	25	18 %	18 %	18 %	..	52 — 55	52 — 55	..	..	..	6 16 4
$41,880,400	Mackay Companies Common	$100	2 %	3½%	4 %	4 %	74 — 78	74 — 78	..	..	..	5 2 7
$50,000,000	Do. do. 4% Cum. Pref.	$100	4 %	4 %	4 %	4 %	71 — 74	71 — 74	..	..	..	5 12 8
694,190	Marconi's Wireless Telegraph	1	Nil	Nil	Nil	..	⅜ — ⅞	⅜ — ⅞	17/8	15/6	..	Nil
72,680	Monte Video Telephone Co., Ltd. Ord.	1	5 %	6 %	6 %	6 %	3⅛ — 3⅜	3⅛ — 3⅜	..	..	..	6 0 9
86,492	Do. do. 5 % Pref.	1	5 %	5 %	5 %	5 %	3⅝ — 4⅛	3⅝ — 4⅛	..	..	..	5 8 11
2,225,000	National Telephone, Pref. Stock	100	6 %	6 %	6 %	6 %	109 —111	109 —111	110½	109½	..	5 7 7
5,725,000	Do. do. Def. Stock	100	5 %	6 %	6 %	6 %	121 —123	120 —124	123	122½	—1	4 16 9
15,000	Do. do. 6 % Cum. 1st. Pref. ..	10	6 %	6 %	6 %	6 %	10½ — 11½	10½ — 11½	..	..	..	5 6 8
15,000	Do. do. 6 % Cum. 2nd Pref.	10	6 %	6 %	6 %	6 %	10½ — 11½	10½ — 11½	..	..	..	5 6 8
250,000	Do. do. 5 % Non-cum. 3rd P., 1 to 250,000	5	5 %	5 %	5 %	5 %	5⅛ — 5⅜	5⅛ — 5⅜	..	..	..	4 5 1
2,000,000	Do. do. 3½ % Deb. Stock Red. ..	Stock	3½%	3½%	3½%	3½%	97½ — 99½	97½ — 99½	..	..	..	3 10 4
1,716,598	Do. do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	99½ —101½	99½ —101½	..	..	..	3 18 10
179,318	Oriental Telep. and Elec. 1 to 171,504, fully paid ..	1	7 %	7 %	8 %	..	1⅜ — 1⅝	1⅜ — 1⅝	..	..	..	5 16 1
50,000	Do. do. do. 6 % Cum. Pref.... ..	1	6 %	6 %	6 %	..	1⅛ — 1¼	1⅛ — 1¼	..	..	..	4 16 0
99,100	Do. do. do. 4 % Red. Deb. Stock ..	100	4 %	4 %	4 %	4 %	88 — 90	88 — 90	..	..	..	4 8 11
99,400	Pacific & European Tel., 4 % Guar. Debs., 1 to 1,000	10	4 %	4 %	4 %	4 %	100 —102	100 —102	..	..	..	3 18 5
11,889	Reuter's	8	5 %	5 %	5 %	..	7½ — 8½	7½ — 8½	..	..	..	4 17 7
99,100	Telephone Co. of Egypt, 4½ % Deb. Red.	100	4½%	4½%	4½%	4½%	98½ —100½	98½ —100½	..	..	..	4 9 7
3,088	Submarine Cables Trust	Cert.	6 %	6 %	6 %	6 %	127 —130	127 —130	..	..	..	4 12 4
120,000	United River Plate Telephone	5	8 %	8 %	8 %	..	6⅞ — 7	6⅞ — 7	6⅞	6 5/8	..	5 14 3
40,000	Do. 5 % Cum. Pref., Nos. 1 to 40,000	5	5 %	5 %	5 %	5 %	4⅛ — 5⅛	4⅛ — 5⅛	..	..	..	4 18 0
80,008	W. Coast of America, 1 to 80,000 & 53,001 to 53,008	2½	Nil	2½%	2½%	..	1 1/16 — 1 1/8	1⅛ — 1⅛	30/-	..	— 1/16	3 11 5
150,000	Do. 4 % Debs., 1 to 1,500 guar. by Braz. Sub. Tel.	100	4 %	4 %	4 %	4 %	99½ —101½	100 —102	..	..	+ ½	3 18 5
207,980	Western Telegraph, Ltd., Nos. 1 to 207,990.. ..	10	7 %	7 %	7 %	..	18 — 18½	18 — 18½	18⅜	18	..	5 3 8
800,000	Do. do. 4 % Deb. Stock Red. ..	100	4 %	4 %	4 %	4 %	101 —103	101 —103	101½	..	..	3 17 8
88,321	West India and Panama Telegraph	10	Nil	Nil	Nil	Nil	⅛ — ⅜	⅛ — ⅜	..	..	..	Nil
84,568	Do. do. 6 % Cum. 1st Pref.	10	5 %	8 %	6 %	6 %	7⅞ — 8⅛	7⅞ — 8⅛	..	..	..	7 7 8
4,669	Do. do. 6 % Cum. 2nd Pref.	10	Nil	Nil	£2 6	..	7⅞ — 8⅛	7⅞ — 8⅛	..	..	..	2 14 1
80,000	Do. do. 5 % Debs., Nos. 1 to 1,800 ..	100	5 %	5 %	5 %	5 %	100 —102	100 —102	..	..	..	4 18 0

ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.

580,000	Anglo-Argentine Trams, 10 % Nom. Cum. 2nd Pref., 260,008 to 580,097	5	8 %	8 %	9 %	..	8 1/16 — 9 1/16	8 1/16 — 9 1/16	9⅛	9 1/32	..	4 19 2
269,007	Do. 6 % Cum. Prefs., 1 to 260,007 ..	5	5½%	5½%	5½%	..	6 — 6½	6 — 6½	6 5/8	6 1/16	..	4 12 0
266,600	Do. Permanent, 6 % Deb. Stock, 1888	100	6 %	6 %	6 %	6 %	137 —142	137 —142	..	..	..	4 4 6
285,100	Auckland E. Trams, 5 % 1st Mort. Deb. Stock ..	100	5 %	5 %	5 %	5 %	101 —103	102 —104	102¾	..	+1	4 16 2
580,000	Babcock & Wilcox, 1 to 580,000..	1	20 %	20 %	20 %	..	4⅛ — 4⅜	4⅛ — 4⅜	8 5/8	8 5/-	..	4 11 5
100,000	Do. do. 6 % Cum. Pref., 1 to 100,000 ..	1	6 %	6 %	6 %	6 %	1 7/16 — 1 9/16	1 7/16 — 1 9/16	..	..	..	3 18 10
60,000	British Aluminium, Ord., 1 to 40,000	5	7 %	7 %	7 %	..	1⅞ — 2	1⅞ — 2	37/6	35/-	..	17 10 0
60,000	Do. do. 7 % Cum. Pref.	5	7 %	7 %	7 %	7 %	3½ — 3⅝	3½ — 3⅝	70/-	..	..	8 12 5
40,100	Do. do. "A" 6 % Cum. Pref.	5	6 %	6 %	6 %	6 %	3⅝ — 4⅛	3⅝ — 4⅛	..	..	..	7 1 2
12,897	Do. do. 4 % Funding Certs.	5	4 %	4 %	4 %	4 %	3⅞ — 4⅛	3⅞ — 4⅛	..	..	..	4 8 11
124,400	Do. do. 5½ % Loch Leven Debs.	100	..	5½%	5½%	5½%	96 — 98	96 — 98	..	..	..	5 12 3
800,000	British Columbia E. Rail Def. Ord. Stock ..	100	6 %	6 %	8 %	8 %	136 —139	136 —139	139	136½	..	5 15 1
400,000	Do. Pref. Ord. Stock	100	5 %	5 %	5 %	6 %	116 —120	117 —121	117½	117½	+1	4 19 2
800,000	Do. 5 % Cum. Perp. Pref. Stock ..	100	5 %	5 %	5 %	5 %	104½ —106½	104½ —106½	106	105	..	4 13 11
283,000	Do. 4½ % 1st Mort. Debs., 1 to 6,250 ..	40	4½%	4½%	4½%	4½%	102½ —104½	102½ —104½	..	..	..	10 15 3
220,000	Do. 4½ % Vancouver Power Debs., 1 to 2,200	100	4½%	4½%	4½%	4½%	101 —104	101 —104	..	..	..	4 6 7
133,361	British Electric Traction	10	3 %	Nil	Nil	..	⅝ — 1	⅝ — 1	..	..	..	Nil
161,457	Do. do. 6 % Cum. Pref.	10	6 %	6 %	3 %	..	3⅝ — 3¾ xd	3⅝ — 3⅞	71/8	68/9	..	7 14 10
1,473,658	Do. do. 5 % Perp. Deb. Stock	Stock	5 %	5 %	5 %	5 %	90 — 95	90 — 95	90	..	..	5 5 3
628,936	Do. do. 4½ % 2nd Deb. Stock Red.	100	4½%	4½%	4½%	4½%	73 — 75	73 — 75	74½	..	..	6 0 1
100,000	British Insulated and Helsby Cables	5	8 %	10 %	10 %	..	6⅝ — 7⅛	6⅝ — 7⅛	6 11/16	..	..	7 2 10
100,000	Do. do. 6 % Cum. Pref.	5	6 %	6 %	6 %	..	6⅛ — 6⅜	6⅛ — 6⅜	..	..	..	4 12 4
500,000	Do. do. 4½ % 1st Mort. Deb. Red...	100	4½%	4½%	4½%	4½%	104 —107	104 —107	..	..	..	4 4 1
208,440	British Thomson-Houston 4½ % 1st Mort. Debs.	100	4½%	4½%	4½%	..	90 — 95	90 — 95	..	..	..	4 14 9
400,000	British Westinghouse 6 % Pref., 1 to 200,000 and 275,001 to 475,000	5	Nil	Nil	Nil	..	⅜ — ⅝	7/16 — 9/16	9/-	..	— 1/16	Nil
1,016,858	Do. do. 4 % Mort. Deb. Stock ..	100	4 %	4 %	4 %	..	43 — 48	42 — 47	..	..	—1	8 10 2
50,000	Browett, Lindley & Co., Ord.	1	Nil	Nil	Nil	..	1/16 — 1/8	1/16 — 1/8	..	..	..	Nil
50,000	Do. do. 6 % Cum. Pref.	1	Nil	Nil	Nil	..	14/6 to 15/6	14/6 to 15/6	..	..	..	Nil
140,976	Brush Electrical Engineering, Ord., 1 to 105,781 ..	2	2½%	Nil	Nil	..	0 — ¼	0 — ¼	..	..	..	Nil
200,000	Do. do. Non-cum. 6 % Pref.	2	6 %	Nil	Nil	..	1/16 — 3/16	1/16 — 1/4	..	..	..	Nil
120,000	Do. do. 4½ % Perp. Deb. Stock ..	Stock	4½%	4½%	4½%	..	59 — 64	59 — 64	..	..	..	7 0 8
125,000	Do. do. 4½ % Perp. 2nd Deb. Stock..	Stock	4½%	4½%	4½%	..	38 — 42	38 — 42	..	..	..	10 14 4
187,610	Calcutta Trams, 1 to 187,610	5	8 %	8 %	6 %	..	4⅜ — 5	4⅜ — 5	98/1½	92/9	..	6 0 0
45,304	Do. 5 % Cum. Pref., Nos. 1 to 29,280..	5	5 %	5 %	5 %	5 %	4⅜ — 5⅛	4⅜ — 5⅛	94/4½	..	..	4 15 3
850,000	Do. 4½ % 1st Deb. Stock..	100	4½%	4½%	4½%	4½%	100 —103	100 —103	102	..	..	4 7 5
85,000	Callender's Cable Construction shares	5	15 %	15 %	15 %	..	9½ — 10⅛	9½ — 10⅛	..	..	..	7 6 4
40,000	Do. do. 5 % Cum. Pref.	5	5 %	5 %	5 %	..	5⅛ — 5⅜	5⅛ — 5⅜	..	..	..	4 6 11
800,000	Do. do. 4½ % 1st Mort. Deb. Stock Red.	Stock	4½%	4½%	4½%	4½%	105 —107	105 —107	..	..	..	4 4 1
491,222	Cape E Trams., 1 to 491,222	1	Nil	Nil	Nil	..	⅜ — ⅝	⅜ — ⅝	..	..	..	Nil
460,000	Castner-Kellner Alkali, 1 to 460,000	1	6 %	8 %	12 %	..	1 3/8 — 1 7/16	1⅜ — 1⅜	..	..	..	7 10 1
510,153	Do. do. 4½ % 1st Mort. Deb. Stock	100	4½%	4½%	4½%	..	103 —107	102 —106	..	..	..	4 4 1
1,848,610	Central London Railway, Ord. Stock	Stock	4 %	4 %	3 %	3½%	60 — 63 xd	63 — 65	65	63	..	5 3 2
488,198	Do. do. 4 % Pref. Stock	Stock	4 %	4 %	4 %	4 %	82 — 84 xd	82 — 84	83½	82½	..	4 15 3
653,156	Do. do. Def. do.	Stock	4 %	4 %	2 %	2½%	45 — 47 xd	45 — 47	46½	45⅝	..	5 2 0
1,460,000	City and South London Railway	Stock	1½%	1½%	2½%	1½%	27 — 28	27 — 28	27½	27	..	5 6 8
66,000	Crompton & Co., Nos. 1 to 66,000	B	2½%	5 %	5 %	..	1⅛ — 1⅜	1⅛ — 1⅜	..	..	— ⅛	10 3 2
100,000	Do. 5 % 1st Mort. Reg. Debs., 1 to 900 of £100, and 901 to 11,000 of £50 Red.	..	5 %	5 %	5 %	5 %	96 — 99	96 — 99	..	..	..	5 1 0

* Unless otherwise stated, all shares are fully paid † A period of nine months. ‡ From Manchester Share List.

Continued on next page

SHARE LIST OF ELECTRICAL COMPANIES.—(*Continued.*)

ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.—(*Continued*)

Present Issue.	NAME.	Stock or Share.	Dividends for the last four years. 1905.	1906.	1907.	1908.	Closing Quotations Feb. 16th.	Closing Quotations Feb. 23rd.	Business done week ended Feb. 23rd, 1909. Highest	Lowest.	Rise + or Fall —	Present Yield per cent. £ s. d.
200,000	Dick, Kerr & Co., 1 to 200,000	1	10 %	10 %	10 %	10 %	1⅛ — 1⅝	1⅛ — 1⅝	..	..	..	7 12 5
305,000	Do. do. 6 % Cum. Pref., 1 to 305,000	1	6 %	6 %	6 %	6 %	1¼ — 1½	1¼ — 1½	23/-	..	..	4 16 0
276,880	Do. do. 4½ % Deb. Stock	100	4½ %	4½ %	4½ %	4½ %	100 —103	100 —103	..	..	..	4 8 8
60,000	Dublin United Trams. (1896), 1 to 60,000	10	6 %	6 %	6⅔ %	6 %	11½ — 12½xd	11½ — 12½	..	..	..	4 18 0
60,000	Do. 6 % Pref. between 1 and 60,000	10	6 %	6 %	6 %	6 %	12½ — 13½xd	12½ — 13½	..	..	..	4 5 9
99,261	Edison & Swan Utd., "A" shs., £3 pd., 1 to 99,261	5	4½ %	4½ %	4½ %	..	1⅞ — 1⅞	1⅞ — 1⅞	..	..	..	16 15 3
17,189	Do. "A" shares, 01—017,189	5	4½ %	4½ %	4½ %	..	2⅛ — 2⅜	2⅛ — 2⅜	..	..	..	8 6 9
817,875	Do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	75 — 78	75 — 78	..	..	..	5 2 7
67,720	Do. 5 % 2nd Deb. Stock Prov. Certs. all pd.	100	5 %	5 %	5 %	..	86 — 89	86 — 89	..	..	..	5 12 4
112,100	Electric Construction, 1 to 112,100	2	Nil	Nil	Nil	Nil	⅜ — ⅝	⅜ — ⅝	..	..	..	Nil
31,890	Do. do. 7 % Cum. Pref., 1 to 31,890	2	7 %	7 %	7 %	7 %	1⅛ — 1⅜	1⅛ — 1⅜	..	..	..	9 6 9
25,000	General Electric Co. (1900), 5 % Cum. Pref.	10	5 %	5 %	5 %	..	7 — 7½	7 — 7½	..	..	..	6 13 4
200,000	Do. do. 4 % Mort Deb.	Stock	4 %	4 %	4 %	4 %	85 — 89	85 — 89	..	..	..	4 9 11
78,000	Gt. N. & City Rail. Pref. Ord. "A" 4 %, 1 to 78,000	10	4 %	4 %	¼	Nil	⅛ — ⅜	⅛ — ⅜	..	..	..	3 6 8
96,000	Greenwood & Batley, 7 % Cum. Pref.	10	7 %	7 %	7 %	..	10½ — 10¾	10½ — 10¾	..	..	..	6 10 3
80,000	Do. do. 5 % Mort. Debs.	100	5 %	5 %	5 %	5 %	102 —103	102 —103½	..	..	..	4 16 10
40,000	Henley's (W. T.), Telegraph Works, Ord.	5	15%	15%	15%	15 %	12 — 13	12 — 13	12⅝	12⅛	..	5 12 5
40,000	Do. do. 4½ % Pref.	5	4½ %	4½ %	4½ %	4½ %	5 — 5⅛	5 — 5⅛	..	..	..	4 1 10
150,000	Do. do. 4½ % Mort. Deb. Stock	Stock	4½ %	4½ %	4½ %	4½ %	106 —108	105⅛—107⅛	..	..	..	4 3 4
50,000	India-Rubber, Gutta-percha & Telegraph Works.	10	10%	0 %	10 %	..	15⅛ — 16⅛	15⅛ — 16⅛	..	..	..	6 1 8
37,500	†Liverpool Overhead Railway, Ord.	10	Nil	Nil	½	Nil	1 — 1⅛	1 — 1⅛	..	..	..	5 6 8
10,000	† Do. do. Pref., fully paid	10	5 %	5 %	5 %	5 %	4¼ — 5¼	4¼ — 5¼	..	..	..	9 10 6
600,070	London United Trams. (1901), 1 to 50,007	10	3 %	3 %	3 %	..	6⅛ — 6⅝	6⅛ — 6⅝	..	..	..	4 8 11
892,980	Do. do. 50,008 to 100,000	10	3 %	3 %	3 %	..	6⅛ — 6⅝	6⅛ — 6⅝	..	..	..	4 8 11
125,000	Do. do. 5 % Cum. Pref., 1 to 125,000	10	5 %	5 %	5 %	..	4 — 4½	4 — 4½	..	..	..	11 2 2
1,881,000	Do. do. 4 % 1st Mort. Deb. Stock	100	4 %	4 %	%	4 %	71 — 75	73 — 77	74½	..	+2	5 3 11
5,782,062	Metropolitan Consolidated	100	22⅝	1⅝	⅛	⅛	36 — 37	35½ — 36½	36⅜	35⅝	— ⅛	1 7 5
2,640,914	Do. Surplus Lands	100	22⅝	23⅝	2⅛	2⅛	69 — 71	69 — 71	70⅜	69¼	..	8 17 6
3,285,000	Do. District	100	Nil	Nil	Nil	Nil	14½ — 14⅝	18⅛ — 14⅝	14⅞	18⅝	— ⅛	Nil
314,016	Metropolitan Electric Trams., Defd.	1	Nil	Nil	Nil	..	⅜ — ⅝	⅜ — ⅝	1/-	..	..	Nil
500,000	Do. do. 5 % Cum. Pref.	1	5 %	5 %	5 %	..	2⅝ — 2¾xd	2⅝ — 2¾	..	..	..	5 19 5
600,000	Do. do. 4½ % Deb. Stock Red.	100	4½ %	4½ %	4½ %	4½ %	93 — 96	93 — 95	94½	..	..	4 13 9
$6,000,000	Mexico Trams Co., Common Stock	..	..	..	..	..	141½—142½xd	136½—138½	140	134½	—5	..
$9,000,000	Do. 1st Mort. 50-year 5% Gld. Bds.	..	..	..	..	5 %	92 — 95	93½ — 94½	95⅞	92⅝	+ ⅛	5 5 10
245,500	Potteries E. Tro.	1	4 %	4 %	4 %	..	⅛ — ⅜	⅛ — ⅜	..	..	..	8 0 0
245,500	Do. 5 % Cum. Pref.	1	5 %	5 %	5 %	..	⅛ — ⅛xd	⅛ — ⅜	..	..	..	6 17 11
245,000	Do. 4½ % Deb. Stock	100	4½ %	4½ %	4½ %	4½ %	90 — 93	89 — 92	..	..	—1	4 17 10
87,850	Telegraph Construction and Maintenance	12	15 %	15 %	7½ %	15 %	82 — 84	82½ — 84½	88⅝	..	..	5 14 10
150,000	Do. 4 % Deb. Bds., 1 to 1,500 Red., 1909	100	4 %	4 %	4 %	4 %	99½—101½	100 —102	..	..	+ ⅛	3 18 5
1,000,000	Underground Electric Railway, 5% Prior Lien	..	..	..	..	..	98½ — 99½	98½ — 99½	99⅜	99	..	..
2,800,000	Do. do. 4½% Bonds	..	..	..	..	4½ %	81 — 83	81 — 83	..	..	..	5 9 9
4,900,000	Do. do. 6% Income Bonds	..	..	..	..	..	29 — 31	29 — 31	30½	30⅛	..	..
66,666	Willans & Robinson, 1 to 80,000 & 80,001 to 116,666	1	Nil	Nil	10 %	..	⅜ — ⅝	⅜ — ⅝	..	..	..	10 0 0
66,666	Do. 6 % C.P., 80,001 to 80,000 & 126,001 to 141,666	5	Nil	..	6 %	..	2⅜ — 2⅝	2⅜ — 2⅝	..	..	..	10 8 8
246,404	Do. 4 % 1st Mort. Deb. Stock	..	4 %	4 %	4 %	4 %	68 — 72	68 — 72	..	..	..	5 11 1

ELECTRICITY SUPPLY COMPANIES.

15,000	Bromley (Kent) E.L. & P., 1 to 15,000	..	5⅛%	5⅛%	5⅛%	..	4⅞ — 5	4⅞ — 5	..	..	..	5 10 0
70,000	Do. do. 4½ % 1st. deb. stock	100	4½ %	4½ %	4½ %	4½%	94 — 98	94 — 98	..	..	..	4 10 0
80,275	Brompton & Kens. Elec. Lt. Sup., Ord., 1 to 20,000	5	10 %	10%	10 %	..	8½ — 8⅝	8½ — 8⅝	..	..	..	5 14 3
9,725	Do. do. 7 % Cum. Pref.	5	7 %	7 %	7 %	..	8 — 8¼	8 — 8¼	..	..	..	4 2 4
826,876	Central Electric Supply 4 % Guar. Deb. Stock	100	4 %	4 %	4 %	4 %	98 — 101	98 —101	..	..	..	3 19 8
80,000	Charing Cross and Strand Electricity Supply	5	5 %	5 %	5 %	5 %	4⅛ — 4⅜	4⅛ — 4⅜	90/-	85/-	..	5 5 8
80,000	Do. do. do. 4½ % Cum. Pref.	5	4½ %	4½ %	4½ %	4½ %	4⅜ — 4⅝xd	4⅜ — 4⅝	87/6	..	..	4 17 4
80,000	Do. "City Undertaking" 4½ % Cum. Prf.	5	4½ %	4½ %	4½ %	4½ %	8⅝ — 4⅞	8⅝ — 4⅞	..	..	..	5 9 1
445,736	Do. do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	96 — 98	96 — 98	..	..	..	4 1 8
49,486	Chelsea Electricity Supply, Ord.	5	6 %	4½ %	4½ %	4½ %	3⅞ — 4⅛	3⅞ — 4⅛	..	..	..	5 5 11
175,000	Do. do. 4½ % Deb. Stock Red.	Stock	4½ %	4½ %	4½ %	4½ %	102 —105	102 —105	..	..	..	4 5 9
70,595	City of London Elec. Lighting, Ord. 40,001—110,595	10	6 %	6 %	6 %	6 %	10⅜ — 11⅛	10⅜ — 11⅛	10⅞	10½	..	5 6 8
40,000	Do. 6 % Cum. Pref., 1 to 40,000	10	6 %	6 %	6 %	6 %	12 — 12⅝	12 — 12⅝	..	..	..	4 14 1
400,000	Do. 5 % Db. Stk., Scrip. (iss. at 115) all pd.	..	5 %	5 %	5 %	5 %	121 —123	121 —123	..	..	..	4 1 4
800,000	Do. 4½ % 2nd. Db. Stk., Prov. Crts., all pd.	100	4½ %	4½ %	4½ %	4½ %	99 —102	99 —102	..	..	..	4 8 3
50,000	County of Durham Electrical Power, Ord.	5	4 %	4 %	2 %	..	2⅜ — 3	2⅜ — 3	..	..	..	3 6 8
50,000	Do. do. do. 5 % Pref.	5	5 %	5 %	5 %	..	3½ — 3⅝	3½ — 3⅝	..	..	..	6 13 4
200,000	Do. do. 5 % 1st Mtg. Deb.	Stock	..	..	..	5 %	96 — 98	96 — 98	..	..	..	..
40,000	County of London Electric Lighting, Ord. 1—40,000	10	5 %	5 %	5 %	5 %	8⅞ — 9⅛	8⅞ — 9⅛	..	..	..	5 8 1
50,597	Do. do. 6 % Pref., 40,001—60,000	10	6 %	6 %	6 %	6 %	10⅞ — 11⅛	10⅞ — 11⅛	11	..	..	5 6 8
400,000	Do. do. 4½ % Deb. Stock	..	4½ %	4½ %	4½ %	4½ %	105 —108	105 —108	107	106½	..	4 3 4
400,000	Do. do. 4½ % 2nd. Deb. Stock	Stock	4½ %	4½ %	4½ %	4½ %	100 —103	100 —103	..	..	..	4 7 5
80,000	Edmundson's Electric Corporation, Ord. Shares	5	4 %	Nil	Nil	Nil	1/16 — 1/8	1/16 — 1/8	..	..	..	Nil
80,000	Do. do. 6 % Cum. Pref.	5	6 %	8 %	Nil	Nil	⅛ — ¼	⅛ — ¼	..	..	..	Nil
480,500	Do. do. 4½ % 1st Mort. Deb. Stk.	100	4½ %	4½ %	4½ %	4½ %	59 — 62	59 — 62	59	..	..	7 0 8
$8,150,000	Electrical Dev.Co.of Ontario, 5% 1stMtg.Gold Bnds.	$500	..	..	..	..	85 — 87	85 — 87	88⅜	85⅞	..	..
10,000	Folkestone, 1 to 10,000	5	5½%	5½%	5½%	..	4⅞ — 5¼	4⅞ — 5	..	..	— ⅛	5 10 0
10,000	Do. 5 % Cum. Pref., 1 to 10,000	5	5 %	5 %	5 %	..	5 — 5⅛	5 — 5⅛	..	..	..	4 10 0
90,000	Do. 4½ % 1st Deb. Stock	100	4½ %	4½ %	4½ %	4½%	95 — 98	95 — 98	..	..	..	4 11 10
15,000	Hove, 1 to 15,000	5	9 %	9 %	8½%	..	6⅛ — 7	6⅛ — 7	..	..	..	6 1 5
$2,400,000	Kaministiquia Power Co., 5 % Gold Bnds.	..	..	..	..	5 %	96 — 98	96½ — 98½	97½	..	+ ⅛	5 1 6
21,000	Kensington and Knightsbridge Electric Ord.	5	10 %	10 %	10 %	..	7⅞ — 8¼	7⅞ — 8¼	..	..	..	6 1 3
90,000	Do. do. do. 4 % Deben. Stk.	Stock	4 %	4 %	4 %	4 %	93 — 96	93 — 96	..	..	..	4 4 3
111,000	London Electric Supply Corporation, Limited, Ord.	3	4 %	4 %	2½%	3 %	1⅜ — 2⅛xd	1⅜ — 2⅛	41/10½	41/-	..	4 16 0
70,000	Do. do. do 6 % Pref.	5	6 %	6 %	6 %	6 %	4⅜ — 5⅛xd	4⅜ — 5⅛	5⅝	5⅜	..	5 14 3
874,395	Do. do. 4 % 1st Mort. Deb. Stk. Red.	Stock	4 %	4½ %	4 %	4 %	90 — 94	91 — 95	94½	..	+ 1	4 4 3
200,000	Metropolitan Electric Supply, 1 to 100,000	5	10 %	8 %	6½%	5 %	4⅜ — 5⅛	4⅜ — 5⅛	5⅛	99/4½	..	6 3 10
76,121	Do. 4½ % Cum. Pref. 1—71,106	5	4½ %	4½ %	4½ %	4½ %	4⅜ — 5	4⅜ — 5⅛	99/9	90/-	..	4 10 0
230,000	Do. 4½ % 1st Mort. Deben. Stock	..	4½ %	4½ %	4½ %	4½ %	105 —108	106 —109	..	..	..	4 2 7
348,000	Do. 3½ % Mort. Deben. Stock Redem.	Stock	3½ %	3½ %	3½ %	3½ %	85 — 88	85 — 88	..	..	..	3 19 7
$6,000,000	Mexican Electric Light Co., 5% 1st Mtg. Gold Bnds	..	5 %	5 %	5 %	5 %	82½ — 89½	86½ — 87½	88⅜	87	—1⅜	5 14 3
13,685,000	Do. Light and Power Co., Ltd., Common	$100	..	..	..	3½%	80½ — 82½	78 — 80	84	78½	—2⅛	4 7 6
$1,500,000	Do. do. 7% Cum. Pref. Stk.	Stock	..	..	..	7 %	111 —113	110 —112	..	..	—1	6 5 0
$12,000,000	Do. do. 5% 1st Mtg. Gold Bnds.	..	..	..	..	5 %	91½ — 92½	89 — 90	91⅝	89½	—2½	5 11 1
250,000	Midland Electric Corporation, 4½ % 1st Mort. Deb.	100	4½ %	4½ %	4½ %	4½ %	95 — 98	95 — 98	..	..	..	4 11 10
87,500	Newcastle-on-Tyne, 1 to 87,500	5	8 %	8 %	8 %	..	3⅞ — 4⅛	3⅞ — 4⅛	82/6	..	..	9 2 10
87,500	Do. 5 % Pref., 1 to 87,500	5	5 %	5 %	5 %	..	5 — 5⅛	5 — 5⅛	..	..	..	4 10 11
126,500	North Metropolitan Electric Power Supply Co., 5 % Mortgages (Red.), Nos. 1 to 1,265	100	..	..	..	..	100 —102	100 —102	..	..	..	..
10,852	Notting Hill Electric Lighting	10	7½%	7½%	7½%	..	11⅛ — 12⅛	11⅛ — 12⅛	..	..	..	6 5 0
20,000	Oxford, 1 to 96 and 407 to 20,310	5	7 %	7 %	7 %	..	5⅞ — 6⅛	5⅞ — 6⅛	..	..	..	5 9 10
60,000	Do. 4 % Deb. Stock	100	4 %	4 %	4 %	4 %	94 — 97	94 — 97	..	..	..	4 1 8
119,691	River Plate Elcty. Co. Ord. Nos. 1 to 120,507	1	..	2½%	..	..	1⅝ — 1⅞	1⅝ — 1⅞	24/9	..	..	..
100,000	Do. do. 6% Non Cum. Pref. Nos. 1 to 100,000	1	6	6	6	..	1⅝ — 1⅞	1⅝ — 1⅞	..	..	..	5 14 3
194,684	Do. do. 5% Deb. Stk. Red.	100	5	5	..	5 %	99 —102	100 —103	..	..	+1	4 17 1
40,000	St. James' and Pall Mall Electric Light, Ord.	5	12½%	10 %	10 %	10 %	8⅞ — 8¾	8⅞ — 8⅞	..	..	..	5 12 8
20,000	Do. do. 7 % Pref. 20,001 to 40,000	5	7 %	7 %	7 %	7 %	6¾ — 7⅛	6¾ — 7⅛	..	..	..	4 16 7
150,000	Do. do. 3½ % Deb. Stock Red.	100	3 %	3½%	3½%	3½%	86 — 90	86 — 90	..	..	..	3 17 9
12,000	Smithfield Markets Electric Supply, Ord.	5	4 %	Nil	Nil	..	⅝ — ¾	⅝ — ¾	..	..	..	Nil
46,700	Do. do. do. 4 % Deb. Stock	Stock	4 %	4 %	4 %	4 %	63 — 70	63 — 70	..	..	..	5 11 1
65,000	South London Electricity Supply, Ord.	4	4 %	3 %	4 %	..	2⅛ — 2⅞	2⅛ — 2⅞	..	..	..	6 10 4
120,000	South Met. Elec. Lt. & Power, Ord.	1	2½%	2½%	2½%	2½%	⅜ — ⅝	⅜ — ⅝	10/-	..	..	3 6 8
142,968	Do. do. 7 % Pref.	1	7 %	7 %	7 %	7 %	1⅛ — 1½	1⅛ — 1½	26/-	..	..	5 12 0
220,030	Do. do. 4½ % 1st Deb. Stk.	100	4½ %	4½ %	4½ %	4½%	100—103	101 —104	..	..	+1	4 6 7
80,000	Urban Electric Supply, Ord.	5	5 %	5 %	5 %	..	⅝ — 1	⅝ — 1	..	..	..	20 0 0
60,000	Do. do. 5 % Cum. Pref.	5	5 %	5 %	5 %	..	1⅝ — 2	1⅝ — 2	..	..	..	12 10 0
275,000	Do. do. 4½ % 1st Mort. Db. Stk. Red.	100	4½ %	4½ %	4½ %	4½%	80 — 83	80 — 83	..	..	..	5 8 5
808,000	Victoria Falls Power Co., Pref. Nos. 1 to 800,000	1	..	..	..	..	⅛ — 1	⅛ — 1	..	..	..	..
110,000	Westminster Electric Supply, Ord.	5	18 %	12 %	10 %	10 %	8⅞ — 8⅞	8⅞ — 8⅞	8½	..	..	5 12 8
81,279	Do. do. 4½ % Cum. Pref. Reduced from 5% since 31st Dec., 1905)	5	5 %	4½%	4½%	4½%	5⅛ — 5⅜	5⅛ — 5⅜	..	..	..	4 1 10

* Unless otherwise stated, all shares are fully paid. † Quotations on Liverpool Stock Exchange. Interim Dividend.

Bank rate of Discount, 3 per cent., January 14th, 1909.

EXPORTS AND IMPORTS OF ELECTRICAL GOODS DURING JANUARY, 1909.

ALTHOUGH the January export returns again show a small decrease as compared with the previous month, it is satisfactory to notice that the general business, exclusive of telegraphic material, is still increasing in value. Thus the exports for January totalled £249,694, as compared with £257,511 in December last, but deducting telegraphic exports, the figures are (January) £227,936 and (December) £220 241.

The total includes £125,000 worth of electrical machinery—an item which reference to our chart (page 197) will show has only once been exceeded in value. As regards the other items of the exports, there are, generally speaking, somewhat lower in value than in the December returns.

The imports section this month embodies a great improvement, in that *the imports are classified according to the country from which they were consigned*, and not, as heretofore, according to the country from which they were shipped. The importance of this alteration can best be gauged by comparing the relative figures for Germany and Holland in the two last returns, which were as follows:—December, £79,081 and £24,547; January, £94,720 and £3,494 respectively. It will also be noticed that several other European countries appear under the new arrangement. The imports total for the month amounted to £156,166, showing a decrease compared with the December total of £174,299. The re-exports at £14,955 are practically stationary.

Prominent purchasers were found in South American countries, Japan, India, and Australia; while of the importers, Germany stands pre-eminent, her position in this matter being, thanks to the new system of returns, unmistakable.

Registered Exports of British and Irish Electrical Goods from the United Kingdom.

Country receiving exports and importing.	Electrical goods and appliances.	Wires and cables, rubber and other insulations.	Electric lighting fittings and accessories.	Electric lamps and parts.	Electric meters and instruments.	Electric machinery.	Electrically-driven machinery.	Batteries and accumulators.	Carbons.	Telephonic cable and apparatus and electric bells.	Telegraphic cable and apparatus.	Total.
	£	£	£	£	£	£	£	£	£	£	£	£
Russia, Sweden, Norway and Denmark ...	257	348	61	104	53	1,474	62	21	...	201	1,019	3,600
Germany	361	685	66	30	47	1,091	...	15	...	26	...	2,321
Netherlands and Dutch Indies	238	894	9	84	...	193	...	...	...	137	...	1,555
Belgium	43	107	30	48	97	723	...	...	...	514	625	2,187
France	156	495	99	854	30	1,426	22	55	...	6	242	3,385
Portugal, Madeira, Portuguese Africa & India	806	170	13	58	12	494	...	610	...	37	296	2,416
Spain and Canary Isles	76	...	21	44	...	295	...	42	...	...	16	494
Italy, Austria-Hungary and Switzerland ...	46	...	20	147	670	3,527	...	...	...	...	...	4,410
Greece, Roumania and Turkey...	169	...	...	...	...	631	...	...	...	...	14	814
Channel Isles, Gibraltar, and Malta	216	25	38	...	92	717	..	...	...	...	51	1,139
U.S.A., Philippines, Costa Rica and Cuba ...	29	...	10	14	7	682	...	...	...	...	647	1,389
Canada and Newfoundland	61	960	68	123	56	325	...	77	...	73	...	1,743
Brit. West Indies, Guiana and Honduras ...	3	18	45	20	17	350	...	...	...	61	968	1,482
Mexico, San Salvador, Ecuador and Colombia	...	...	29	...	...	126	...	...	...	4	17	176
Peru and Uruguay	76	63	65	...	...	1,207	33	12	...	13	25	1,494
Chile	160	272	107	241	6	905	...	..	...	28	602	2,331
Brazil	208	533	211	400	45	16,791	7	196	...	23	5,961	24,375
Argentine	1,486	2,519	132	462	872	18,585	313	2,915	32	552	2,770	30,938
Egypt, Tunis and Morocco	876	25	128	60	...	3,047	14	15	...	262	45	4,472
British West Africa	46	...	16	94	...	329	6	...	...	93	787	1,371
Cape of Good Hope	260	521	106	...	20	366	...	62	12	...	1,239	2,586
Natal	958	3,497	366	262	127	1,220	...	184	...	8	320	6,942
Transvaal and Rhodesia	...	231	...	366	...	1,088	...	...	26	1,583	13	3,307
Zanzibar, Brit. East Africa, Mauritius, & Aden	128	...	...	48	...	...	...	8	...	57	167	408
China and Siam	488	1,108	154	317	32	1,344	...	18	...	191	152	3,804
Japan and Korea...	439	2,410	294	306	299	20,020	52	4,726	25	3,482	2,111	34,164
India { Bombay...	507	1,835	132	213	269	5,730	447	391	31	312	338	10,215
India { Madras	265	507	21	63	...	2,223	13	8	..	50	56	3,206
India { Bengal	630	4,725	597	443	906	7,800	623	1,100	616	78	1,849	19,367
Burmah	685	96	158	103	17	6,860	...	3	...	102	...	8,024
Ceylon	67	266	81	81	...	174	17	82	...	15	46	829
Straits Settlements and Fed. Malay States ...	302	1,365	82	117	...	3,616	43	43	...	51	308	5,977
Hong Kong	185	7,341	749	121	107	2,563	...	1,712	10	33	26	12,847
West Australia	22	149	6	87	17	1,045	...	22	27	15	...	1,390
South Australia	679	1,422	701	82	3	2,004	...	1,118	...	1,903	...	7,912
Victoria	870	4,935	23	119	466	1,851	20	609	...	1,539	212	10,644
New South Wales	1,462	2,856	285	769	39	10,543	...	234	...	18	635	16,841
Queensland	...	...	69	230	...	551	...	...	...	...	...	850
Tasmania	46	508	...	11	...	...	...	30	...	...	...	595
New Zealand	457	2,051	262	253	...	4,119	...	191	18	112	141	7,604
Total, £	13,773	42,937	5,254	6,784	4,306	126,025	1,672	14,499	797	11,889	21,758	249,694

Registered Imports into the United Kingdom of Electrical Goods from all Countries.

	£	£	£	£	£	£	£	£	£	£	£
Norway, Sweden and Denmark	...	36	...	61	6	625	...	534	101	2,579	3,942
Germany	1,557	11,660	1,322	47,078	1,588	15,207	146	1,425	6,573	8,364	94,720
Holland	3	80	...	2,929	17	400	...	46	19	...	3,494
Belgium	416	1,146	32	23	250	735	26	158	646	7,072	10,454
France	10	150	425	6,545	1,216	198	...	1,255	2,797	2,349	15,343
Switzerland	6	510	...	288	47	141	...	...	163	126	1,281
Italy	109	590	...	...	...	3	...	...	...	...	702
Austria-Hungary...	...	993	...	923	2	85	...	...	4,409	54	6,466
United States	2,430	98	1,169	429	...	12,138	2,510	308	328	79	19,549
Total, £	4,331	15,263	2,968	58,674	3,126	29,532	2,722	3,676	15,036	£20,623	155,951

Additional Imports: New South Wales, electrical machinery, £10; Queensland, electrical machinery, £8; Canada, batteries, £17; electrical machinery, £180.

Registered Re-Exports of Foreign and Colonial Electrical Goods from the United Kingdom.

	£	£	£	£	£	£	£	£	£	£	£	
Various countries, mainly as above	1,890	150	...	2,057	...	3,188	...	364	278	5,893	230	...

TOTAL EXPORTS: £249,694. TOTAL RE-EXPORTS: £14,955. TOTAL IMPORTS: £156,166.

NOTE.—The amounts appearing under the several headings are classified according to the Customs returns. The first and third columns contain many amounts relating to "goods" otherwise unclassified, the latter, doubtless, consisting of similar materials to those appearing in adjacent columns.

THE ORGANISATION OF (OUTDOOR) CONSTRUCTION WORK.

By W. S. BURGE.

The necessity of a well-conceived system of organisation is, perhaps, nowhere more evidenced than on outdoor construction work, especially where contracts of any magnitude are involved.

Every contractor is only too conscious of the evils arising from bad or deficient organisation. The costly mistakes, misunderstandings, and the time lost for want of material or for lack of definite information between the parties concerned, mean most serious loss of time and money, to say nothing of the irritation and general bad feeling engendered all round.

In dealing with several outside contracts from one head office, it is possible to greatly simplify the dispatch of business by the adoption of special report forms and cost cards, designed with a view to expressing the fullest meaning and significance with the least possible writing, so that the amount of correspondence between a contractor's head office and the various men in charge of outside work is greatly reduced. Apart from simplifying the reporting and general correspondence, each card may be worked in conjunction with a routine that ensures immediate attention and consequent dispatch of business.

As regards costs, it is of the utmost importance that the man in charge of a construction job of any magnitude should keep, week by week, a record of the total cost of his job, and in order to ensure this being done the total cost must be entered up on a special form and sent with the weekly wages sheets to the head office, so that it may be checked, compared with the estimated cost for construction, and returned with any necessary remarks. It is not uncommon for a man to be sent on to a job with no provision whatever for keeping the cost of his work, with the result that it may run up alarmingly before any notice is taken.

Starting with the wages, little need be said, as the wages card shown in fig. 1 is very similar to most others (except in point of size) and will be found adaptable to most conditions.

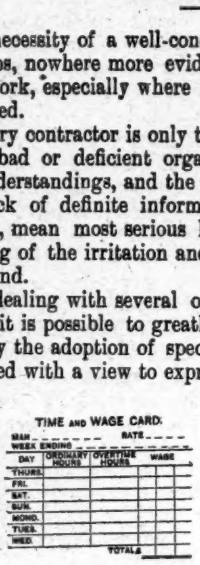

Fig. 1.

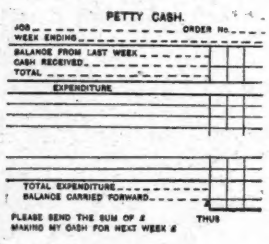

Fig. 2.

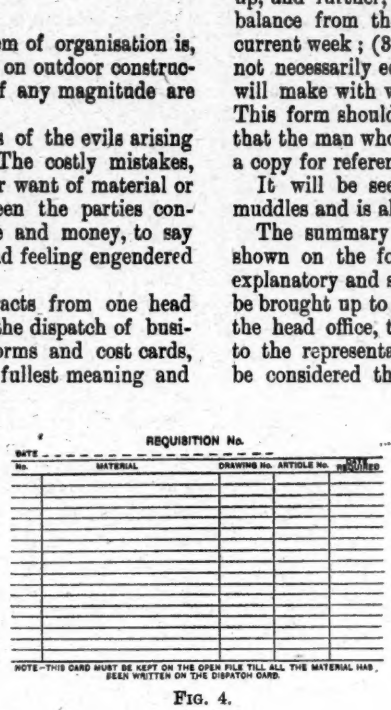

Fig. 4.

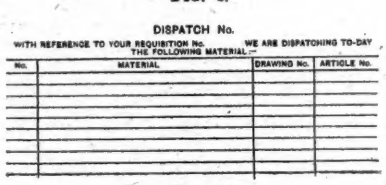

Fig. 5.

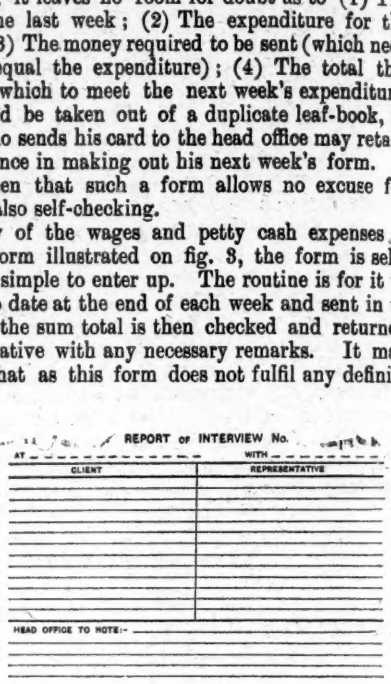

Fig. 6.

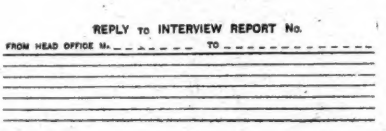

Fig. 7.

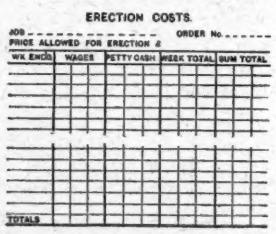

Fig. 3.

The petty cash and general expenses can be very simply kept by means of the form shown in fig. 2. It will be seen that the wording and arrangement of the form are so simple that no knowledge of book-keeping is needed for entering it up, and further, it leaves no room for doubt as to (1) The balance from the last week; (2) The expenditure for the current week; (3) The money required to be sent (which need not necessarily equal the expenditure); (4) The total this will make with which to meet the next week's expenditure. This form should be taken out of a duplicate leaf-book, so that the man who sends his card to the head office may retain a copy for reference in making out his next week's form.

It will be seen that such a form allows no excuse for muddles and is also self-checking.

The summary of the wages and petty cash expenses is shown on the form illustrated on fig. 3, the form is self-explanatory and simple to enter up. The routine is for it to be brought up to date at the end of each week and sent in to the head office, the sum total is then checked and returned to the representative with any necessary remarks. It may be considered that as this form does not fulfil any definite purpose, it is superfluous; I would point out, however, that it has the very important end in view of detecting and drawing notice to any abnormal rise in the wages or petty cash expenses.

Apart from the weekly receipts and disbursements, there are other transactions between the contractor's office and their representative that are continually recurring, and admit, therefore, of simplification by means of standard forms, worked with a definite routine. In fig. 4 is seen a requisition for ordering material from the works on to any outside job. If the material required is a finished article, the article number and the drawing number are given for reference; if, however, the material is simply unmanufactured, the columns for Article No. and Drawing No. are left blank. It is important that this form should be taken out of a duplicate leaf-book, so that the representative may have a check on the material he has requisitioned till he has received from the works the dispatch card shown in fig. 5. This dispatch form must also be taken out of a duplicate leaf-book, and the head office should never close a requisition till the corresponding dispatch form is written out. There should be a hard-and-fast rule that all requisitions must be kept on an open file and filed in order of the date at which the material is required, till the material is written off on the dispatch form; the requisition form may then be transferred to the closed file. The representative, in like manner, should O.K. the copies of his requisitions on receipt of the corresponding dispatch form.

When a representative has a conversation with his clients, which it is necessary to report to the head office, a form shown in fig. 6 will greatly simplify reporting and ensure immediate attention. It will be seen that there is a clear and divided space recording (1) the client's requests or remarks, (2) the representative's answer, and (3) the special point that the representative wishes his head office to note and reply to. Such a report as this does not leave any loop-

hole for a misunderstanding, and it is sure to receive immediate attention. On receipt of this form the head office should put it in an open file kept specially for this class of report; then, when there is time to attend to it, a reply is written on the form shown in fig. 7, and the report form may then be transferred to a closed file. Both the report and the reply forms should be taken out of duplicate leaf books, so that the head office and the representative may have a check on themselves and each other.

There is nothing formidable in such a system, and it involves nothing more than the small amount of attention that any outside foreman with average intelligence and ability ought readily to be able to give to it.

For the contract superintendent at the head office, a well-conceived system will greatly simplify the dispatch of his business, and guard against serious delays and muddles. Nothing is more disconcerting to the organisation of outside work than to have a number of subjects brought into one blank page report; in such a case every report has to be carefully read over and analysed, with the result that a large amount of time is wasted, important points may be overlooked, and it is most difficult to refer to a past transaction, or to ensure that any report has not been overlooked.

On the other hand, a well-conceived system, which is worked to a strict routine, will keep all avenues of information constantly supplied, and the whole system becomes practically automatic in its working.

COMBINED TRACK CIRCUIT AND CAB SIGNALLING.

A Reply by Capt. A. GARDINER, R.E.

(*Concluded from page* 321.)

"The Writer of the Article" pleads the complicated junctions of England as a reason for vetoing my cab signal as impracticable. In doing so he is still laying far too great stress on his own interpretation of what he has selected as my "dictum." I contend that there are no conditions under which semaphore signals can be interlocked with the points, under which also the meaning of those signals cannot be reduced to the simple issue of "proceed" or "stop" for the "track conductor" of my cab signal. I contend that the very number and complication of the English junctions constitute urgent reasons for carrying out this operation. I do not say that of the problems presented by complicated yards every one can always be solved by anyone or in half an hour; but I believe that every one is soluble, and should be finally solved once and for all in the peace and quiet of the office and by skilled engineers, and not be left half solved for the drivers to finish the problem in the flash of a moment and under conditions frequently most unfavourable.

Under the altered circumstances presented by the short blocks and more definite detection of obstructions created by the track circuit, selective and emergency signals, &c., can largely be dispensed with. "Tail lights out" would still be reported no doubt by the remaining pointsman; but the dire necessity for this report, arising from the risk that the reason for the phenomenon is that part of the train has been left behind, and is still fouling the route, no longer exists, for the track circuit will protect a following train from colliding with it. But even if some special signals continue to be desirable, it is unlikely that it is beyond the wit of man to devise them without the aid of a semaphore. It is certainly too soon to condemn an "all cab signal" proposal as impracticable for want of them.

As regards "scrapping," assuredly the companies concerned will first satisfy themselves that it is "worth their while," and I trust that I have made it clear that the mileage over which "the system in question" can be applied is at least greater than my critic presumed, and said enough to awaken further interest in the subject. "The main object of signalling," I take it, is the safety of the rolling stock, its passengers and crews; and that this safety is not assured by the semaphore has been proved over and over again by the semaphores being disregarded. A breakdown of this safety involves, besides the stigma of the accident and its resultant loss of life and limb, an expenditure in compensation for injuries and replacement of stock that, taken all together, constitute sound reasons for displacing the apparatus that has been improved upon; and though "a certain amount of risk must" no doubt "always be faced by travellers," it is in the interests of both the railways and their passengers to reduce these risks to the minimum that is reasonably practicable.

The advantages that the railway companies will reap from the introduction of a correctly designed system of signalling in which the track itself indicates its condition are that the cost of the staff is proportionately reduced, and the result of a breakdown is restricted, as stated by Col. Gardiner, to merely delaying the movements of the rolling stoc instead of possibly smashing it up. The advantages of continuous signalling are, in the first place, that the dangerous snare of a signal on the locomotive that depends upon the correct working of an apparatus at certain points *in order to remove* a previous "clear" signal, and, if necessary, substitute a "danger" one, is avoided; that the necessity for maintaining an outside system of semaphores in addition to a system of cab signals disappears; and, finally, that traffic is transported with the minimum delay, since the removal of an obstruction is instantly reported, wherever the engine may be, instead of its having to proceed slowly to the next signalling point in order to obtain this information. My critic asks "Will the systems put forward increase the safety of railway travelling?" Surely my whole paper claims "Yes!" One may ask "How?" but not "Will it?" for the signal has no other *raison d'être*. "Will it enable the companies to carry out their transport work more quickly?" Again the answer is "Yes;" but, in the main, only to the extent that other automatic systems do; and therefore for proof go to the automatically-signalled lines, the London and South-Western, the District, and the Americans.

I am glad "The Writer of the Article" has no prejudice against either the cab signal or the track circuit; but I would ask him in considering *the general adoption* of a cab signal by railway companies to remember that he is advocating additional mechanisms and additional items of expense, while I am advocating substitution. At least "scrapped" systems require no maintenance.

Capt. Gardiner's letter is a lengthy epistle which I cannot hope to rival. Much of it, however, is taken up with matters with which it is unnecessary to deal in this letter.

Capt. Gardiner modestly disclaims absolute accuracy for the diagram accompanying his letter, and alludes to his "inexperience" in such matters. The arrangements are ingeniously contrived, but there is at least one slip in the "interlocking." As shown, when a train is passing B from A to C, a danger signal will be given to a train passing through the section 6-8, although there is, of course, no interference between the two trains. This is due to the lower contact of B_3 being broken by any train between 3 and P_1, whether that train is going to D or to C. The error, however, is one that is easily remedied. Consider, however, Capt. Gardiner's methods of obtaining his objects, in the light of his authoritative statement, or dictum, on page 6 of his paper, of Col. Gardiner's explanation thereof, and of Capt. Gardiner's further explanation in his last letter.

Capt. Gardiner arranges that the "selection" of the right of way for traffic, *i.e.*, what signals shall be given to any line, shall be given by the "lay" of the points. This is correct enough in principle; but it is not signalling *by trains*. Capt. Gardiner prefers to call the operator at B a "pointsman" rather than a "signalman," but a difference in name will not alter his functions. Surely the actions referred to constitute "interference." Over and above this, Capt. Gardiner provides special levers by which the pointsman may override the indications of the track circuits independently of the points. Surely this is "interference" also.

Capt. Gardiner's arrangement abrogates signalling "by intention" for the normal lay of the points. "Signalling by intention" is one of the fundamental bases of block signalling in this country, and implies operation only after a full knowledge of the circumstances obtaining has been obtained. I am aware that this raises the old question of "normal danger" *versus* "normal clear," and I would not, on any account, seek to ventilate the question again.

Capt. Gardiner's new rules read like specifications to the Signal Co. for equipping the line rather than regulations for the sig-pointsman, but they are illuminative on the point of human control. Capt. Gardiner does not show the operation of the cross-over for the reasons given in his letter. But the arrangements, if shown, would have made a good deal of difference in the appearance of his diagram. Neither are the arrangements necessary to give the "route indication" given, either by the aid of the "reduce speed" apparatus or otherwise, and the circuits for controlling the magnetic pawls (track or signalling) are not indicated. These arrangements, again, will considerably affect the appearance of the diagram. The magnetic pawls would seem to be something out of the ordinary, since, for a train passing from C to A *without stop*, the pawl controlling P_1 must prevent it from being operated, whereas, for a train *standing* between 6 and 8, it must allow of P_1 being changed to send a train to D.

Capt. Gardiner shows no apparatus corresponding to that now used to make the preliminary arrangements, but says that trains approaching B will announce *forward*, by means of the track circuit, their approach. No attempt is made to show this in the diagram, and such arrangements will make a considerable difference in the appearance of the diagram. And in describing the train selection by the pointsman, Capt. Gardiner says he—the pointsman—"must pull over the points P_1 before the new train from C comes dangerously close . . . ." H'm!

Again, with regard to the "next stations or junctions on either side where points may have to be moved." Does "next" mean "next in order," or "next . . . . where points . . . ."? There are remarkably few stations where points have not to be moved at some time, or junctions either. Capt. Gardiner has no apparatus by which the pointsman can ascertain whether the signalling is in order or not, and, beyond the ramp, no means are provided to enable the driver to localise his position. If running under misapprehension he may easily overshoot the ramp and come into dangerous proximity to the junction. Such trivial things as these will also change the appearance of Capt. Gardiner's diagram; and whatever changes the appearance of the diagram is likely to have an effect upon the cost of the work.

Capt. Gardiner ignores entirely the difficulties attendant upon reliance on a cab-signal alone, should the apparatus on the engine fail.

Capt. Gardiner is, no doubt, aware that there are other emergency signals than "Tail lamp out," and that the risk of part of the train being left standing on the track is not the only risk in connection with the breaking away of part of a train.

I am afraid I cannot follow Capt. Gardiner through all his assertions: if assertions were proofs one could, no doubt, congratulate Capt. Gardiner on making an early start with the wholesale conversion of signalling. Capt. Gardiner's ideas have been developed as the result of the correspondence you have been good enough to allow, and it is now possible to judge of the value of his proposals. Much more might be said, but enough is—enough. It does not seem even necessary to plot a temperature curve for the collectors for different speeds, or to ascertain the rates of wear. With reference to track-circuit signalling generally may I quote, for Capt. Gardiner's benefit, from the report of the Block Signal and Train Control Board of the U.S.A. Interstate Commerce Commission dated November 20th, 1908, as follows:—"The Northeastern Railway of England abandons its automatic block during fog, and falls back on its manual block, the operating officers appearing to believe that they can better do without the track-circuit protection in such cases than without the verbal information given by the signalmen for each train movement."

The Writer of the Article.

PROCEEDINGS OF INSTITUTIONS.

The Royal Society.

At the ordinary meeting on Thursday, February 4th, a paper by Dr. G. C. Simpson was read "On the Electricity of Rain and its Origin in Thunderstorms."

During 1907-8, an investigation was undertaken at the Meteorological Office of the Government of India, Simla, into the electrical phenomena which accompany rain and thunderstorms, with results which have led to the following theory:—

It is exceedingly probable that in all thunderstorms ascending currents greater than 8 metres a second occur. Such currents are the source of large amounts of water which cannot fall through the ascending air. Hence, at the top of the current, where the vertical velocity is reduced on account of the lateral motion of the air, there will be an accumulation of water. This water will be in the form of drops which are continua ly going through the process of growing from small drops into drops large enough to be broken. Every time a drop breaks, a separation of electricity takes place, the water receives a positive charge and the air a corresponding amount of negative ions. The air carries away the negative ions but leaves the positively charged water behind. A given mass of water may be broken up many times before it falls, and, in consequence, may obtain a high positive charge. When this water finally reaches the ground, it is recognised as positively charged rain. The ions which travel along with the air are rapidly absorbed by the cloud particles, and in time the cloud itself may become highly charged with negative electricity. Now within a highly electrified cloud there must be rapid combination of the water drops, and from it considerable rain will fall; this rain will be negatively charged.

A rough quantitative analysis shows that the order of magnitude of the electrical separation which accompanies the breaking of a drop is sufficient to account for the electrical effects observed in the most violent thunderstorms. All the results of the observations of the electricity of rain described in the paper are capable of explanation by the theory, which also agrees well with the actual meteorological phenomena observed during thunderstorms.

A paper by Dr. W. G. Duffield on "The Effect of Pressure upon Arc Spectra" was read, and one by Mr. G. Gerald Stoney on "The Tension of Metallic Films Deposited by Electrolysis."

It is well known that metallic films deposited electrolytically are in many cases liable to peel off if deposited to any considerable thickness, especially in the case of nickel, which, if deposited above a certain thickness, curls up into beautiful close rolls in cases where the film does not adhere closely to the body on which it is deposited.

These phenomena would be explained if the metal were deposited from the solution under tension, and it was found that when a thin steel rule was coated on one side with nickel it became bent, even to the extent of 3 or 4 mm. in 100 mm. This bending could not be caused by any difference of expansion between nickel and steel, as the whole was immersed in the depositing solution, and this was at a constant temperature. From the thickness of the rule, the amount of nickel deposited, and the bending, the tension under which the film was deposited was calculated and found to amount to 2,840 kg. per square cm., or 18·1 tons per sq. in. It was also found that this tension was independent of the temperature and strength of the solution as well as the current density so long as the deposit was a good dense one. When the rules were heated to a red heat to anneal them, the deflection was reduced to from one-third to one half of the original.

The Faraday Society.

Application of Electrolytic Chlorine to Sewage Purification.

Electrolytic chlorine, or, to be more accurate, sodium hypochlorite solutions produced by the electrolysis of aqueous sodium chloride, has for some time been recognised as possessing more valuable sterilising and deodorising properties than does chlorine in the form, say, of chloride of lime. The successful use of these solutions on a comparatively small scale for local borough purposes, by Dr. F. W. Alexander, at Poplar, has recently attracted a considerable amount of attention; but their value for sewage purification on a large scale, and especially for the complete sterilisation of sewage already partly purified, has not, perhaps, received the recognition it deserves. Dr. S. Rideal, who read a paper on this subject before the Faraday Society on Tuesday, February 9th, has been making a special study of it for some years past, and the present paper describes fully the results of some fairly large-scale experiments on the use of hypochlorite solutions in sewage treatment made at Guildford on the town sewage at the Corporation works.

The hypochlorite used by Dr. Rideal was made in the electrolyser of the Oxychlorides Co.—a cell originally devised by the late Mr. Atkins. In its first form, this electrolyser was a semicircular wooden trough (afterwards made nearly circular in section), lined with specially prepared Acheson graphite, on a metallic base, which formed the anode. In this trough revolved the cathode, a wooden cylinder covered with lead, attached to a copper ring with a rubbing contact block. The solutions produced by this cell were suitable for many purposes, but in order to reduce the salt consumption and increase the concentration, a diaphragm is now used. Unfortunately—if naturally—no information is available regarding the composition of this diaphragm, but it is stated to have long life and not too

much resistance. A common trouble with such diaphragms is the tendency to clog which they show after being in use for some time, but this difficulty appears to have been surmounted in the "oxy-chlorides" cell. With a current of 1,500 amperes at 4·6 to 5 volts, according to the density of the electrolyte, the current efficiency of the cell, measured in terms of available chlorine (*i.e.*, chlorine available for oxidising purposes) is 65 per cent, at the end of continuous 8 to 10-hour runs, and the salt consumption for that period about 90 lb. In a diaphragm cell there is some tendency for chlorate to form in the anode chamber (especially if the solution is urine), but this has now been reduced to about the equivalent of 3 per cent. of the current efficiency in available chlorine. Electro-chemists are still undecided as to what is the exact constitution of these electrolytic hypochlorite solutions, and Dr. Rideal has recently found that the chlorite ion ClO_2 is present, as well as the hypochlorite ion ClO. As to the actual mechanism of the part played by the available chlorine of electrolytic hypochlorite solutions in the sterilising of sewage, little is known. It is certain, as demonstrated by Dr. Rideal's experiments, that the presence of the chlorine very greatly reduces the number of bacteria present in an effluent, but whether these germicidal properties are merely on account of its oxidising properties is doubtful. Mr. J. H. Johnston, in the course of the discussion following Dr. Rideal's paper, threw doubt on the prevailing theory that ordinary sewage purification, that is, the removal of the organic matter, is bacterial in its action, and he pointed out that some recent researches have shown the purification to be physico-chemical in action, due to the fact that sewage is a colloidal solution.

The sewage effluent as it emerged from the septic tank, in Dr. Rideal's Guildford experiments, was dark in colour, more or less fetid from the presence of sulphuretted hydrogen, and it contained very large numbers of bacteria, some of them of a dangerous character. The addition of the hypochlorous liquid removed the odour, and as already stated, not only destroyed the disease-producing organisms, but actually aided the subsequent purification in the bacterial coke filters by causing the filter beds to mature more rapidly, and keeping the pipes and filters free from fungus growths, so that a finer filtering medium could be used. These tests (which are fully described in the paper), made on a really practical scale, seem conclusively to establish the value of electrolytic chlorine in aiding in the prevention of the pollution of our rivers, and of the dissemination of disease from hospital and other highly infected sewage. It is to be hoped that the publication of them will remove some of the suspicion which has curiously surrounded the newer methods of sterilisation in the minds of sanitary experts, and will encourage not only the local authorities, but also the Local Government Board to give serious consideration to what is decidedly the most important advance made in recent years in the elimination of the various nuisances and dangers caused by incomplete purification of sewage effluents.

Parallel Operation of Alternators.

By Dr. E. Rosenberg, M.I.E.E.

(*Discussion in London, January 28th*, 1909. *For abstract of paper see p.* 280.)

Mr. Gerald Stoney, who opened the discussion, said that even turning moment was the most important consideration, and the regulation of the alternator a secondary matter, as alternators as now built would carry heavy overloads without dropping out of step. He did not consider damping coils necessary in the case of modern alternators with thick laminations in the rotors or heavy pole tips. Where alternators of varying wave form were running in parallel, it was advisable to earth the star of only one of them. He considered that attention to governor adjustment would overcome the majority of troubles, and expressed a preference for high-speed governors. So far he had never failed to run his machines in parallel with others.

Mr. F. H. Clough thought that cyclic irregularity could be best stated as the maximum displacement of a point on the fly-wheel from what it would be with uniform rotation. The author had not referred to the effect of change in magnetising current; he (the speaker) could not see that dampers were of any great value.

Mr. G. W. O. Howe emphasised the importance of valve setting, as steam distribution was largely responsible for defective parallel running. The author's cures seemed always to involve more fly-wheel, but some years ago the use of small fly-wheels and amortisseurs had been recommended in a paper before the American Institute of Electrical Engineers.

Prof. Silvanus Thompson suggested that hunting alternators did not give much trouble in this country now. He regretted that there was no instrument on the market for measuring cyclic irregularity. In this country the high-speed machine with few poles, commonly adopted, largely obviated the trouble which large multipolar machines experienced. He thought that the author had made out a case against the running of alternators by means of slow-speed gas and steam engines, with speeds of less than 100 R.P.M. He was, however, surprised to learn that the single-acting was preferable to the double-acting engine under the circumstances mentioned in the paper.

Mr. H. M. Sayers mentioned a case with which he was connected, where it had been found possible to run several machines, having individually poor regulation, fairly well with one well-regulated machine. In connection with engine governors, which produced hunting, a way out of the difficulty was to disconnect all the governors except one, which would control the speed of the plant.

The President asked as to the effect of driving through flexible couplings; the best example of parallel running which had come under his notice consisted of some 150-kw. single-acting Westinghouse gas engines flexibly coupled to alternators. He supposed that variation in turning moment was usually calculated.

Dr. Rosenberg, in the course of a brief reply, said that cyclic irregularity was usually calculated from the turning moment diagram. He could not agree that Prof. Thompson's conclusions were necessarily correct as regarded large multipolar machines.

The Use of Large Gas Engines for Generating Electric Power.

By Leonard Andrews, M.I.E.E., and Reginald Porter, B.A., A.M.I.E.E.

(*Abstract of Paper read before the* Institution of Electrical Engineers, *London and Dublin, on February 11th, and at Manchester, February 16th.*)

(*Concluded from page* 325.)

In working the gas plant, the coal is fed by means of the endless chain elevator A A (fig. 5) into the bunkers above the producers from which it gravitates through the valve B to the hopper C

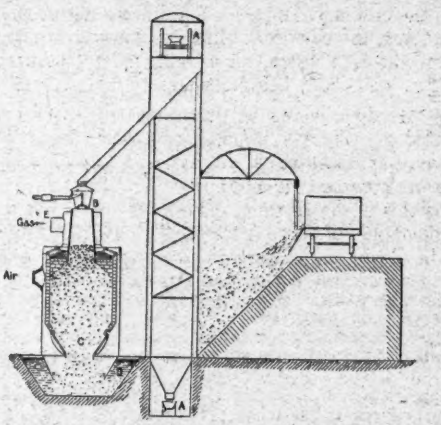

Fig. 5.—Section of Producer and Coal-Handling Plant.

From the hopper it is fed into the producer as the fuel therein gradually burns away. The ashes are regularly withdrawn through the water lute every four hours, the quantity being determined by the rapidity of combustion in the producer.

The hot gas is escaping from the outlet E at the top of the producer pass into the superheater, which consists of a series of vertical pipes surrounded by the steam and air passing on their way to the producer. A considerable portion of the sensible heat is herein extracted and utilised.

The gas is then passed to the mechanical washer, where it is treated with a spray of warm water thrown up by revolving paddle-wheels. The dust and soot in the gas are by this means removed and the temperature of the gas considerably reduced. The warm water is also at the same time heated up and passed to the air saturator, in which, by heating and saturating the air on its way to the producer, it is cooled for further use in the washer.

The gas next enters the mechanical ammonia absorber, where it meets a fine spray of a solution of sulphate of ammonia, which contains a small amount of free sulphuric acid. In this apparatus the acid in the solution combines with the ammonia in the gas, producing sulphate of ammonia. The acidity of the liquor is kept up by a small trickle of sulphuric acid into the absorber; the sulphate liquor, which is continually being augmented in volume by the new sulphate of ammonia formed, slowly and continuously trickles out of the absorber to the stock liquor tanks.

The gas is next treated in a mechanical gas cooler, where it meets a spray of cold water, and gives up the bulk of its tar. The gas leaving this cooler passes to the air regulator, a small gasholder, the height of which regulates the quantity of air supplied by the blowers. Thence the gas passes through two centrifugal cleaners in series, which, revolving at high speeds and in conjunction with a small amount of injected water, effectually remove all but very small traces of the tar contained. These latter are removed by passing through the sawdust scrubbers, whence it emerges in a thoroughly cool and purified condition and enters another gasholder, which serves to keep a constant pressure in the supply main to the gas engines.

The non-recovery process (the apparatus for which is shown on the left of the general lay-out drawing fig. 4) is very much simpler. The gas, in this case, passes direct into the cooling washer, and from this through the gas regulator and centrifugal cleaners to the scrubbers and engines. It will be noted that a spare blower, washer, regulator and centrifugal cleaner are provided, which may be used either for the non-recovery producers on the left, or for the recovery producers on the right. In the latter case, the recovery producers become non-recovery producers.

Running Cost.—The fuel consumption of a gas plant, as of a steam plant, is dependent upon at least four important factors;—

1. The actual output;
2 The no-load losses, which include all power required for auxiliaries;
3. Standby losses; and
4. The ratio of the actual fuel consumption under working conditions to the theoretical consumption based upon test results, which we will term the discrepancy factor.

Whereas the steam consumption per unit generated of steam turbines gradually decreases as the output of the plant is increased, the corresponding curve of gas-driven generators is constant for all outputs. Various tests on gas engines of outputs ranging from 500 B.H.P. to 5,000 B.H.P. show that the actual consumption of fuel per unit generated, exclusive of no-load losses, is approximately 1 lb. per kilowatt-hour for any output from no load to full load.

As four 10,000-lb. boilers are required for each 2,000-KW. unit in connection with the steam turbine station on which we have based our calculations, the coal for banking these boilers will be at least 448 lb. per hour per plant unit.

The fuel required for banking producers is only a small fraction of that required for banking boilers. The heat radiation from the producer is also extremely small, because the annular space between the fire-brick lining and the outer casing constitutes one of the best non-conductors of heat it is possible to obtain.

The standby losses of the producers for the scheme under consideration are guaranteed not to exceed 50 lb. per hour per producer.

It is difficult to keep the discrepancy factor within reasonable limits. This is accounted for by variations in the quality of the fuel supplied, by fuel utilised in heating up cold boilers, by the gradual fouling of boiler tubes, condenser tubes, &c., between cleaning periods, by errors of judgment as to the correct time for running up and shutting down plant units, and other seemingly small details which in a well-managed station receive constant attention, but the effects of which cannot be entirely eliminated.

For both the steam plant and the gas plant we have added 25 per cent. to the ascertained fuel consumption under test conditions to cover the above contingencies.

Now, for a maximum demand of 8,000 KW., a load factor of 24 per cent. and a distribution efficiency of 80 per cent., the units generated per annum will be 21,000,000. For a 2,000-KW. turbo-alternator the steam consumption per unit generated is 15·5 lb., or, assuming an evaporation of 8 : 1, 1·94 lb. of coal. The no-load losses for a plant of this size amount to 900 lb. per hour.

To determine the plant-unit-hours run, and the boiler-hours banked, we have plotted the average hours the respective plant units would be required each day to deal with the given load curve.

It appears that the minimum total engine-hours would be 35 hours per day, or 12,800 hours per annum, and the banked boiler-hours would be 45 hours per day or 16,800 hours per annum.

The total annual coal consumption for the steam turbines will therefore be as follows:—

21,000,000 units at 1·94 lb.	18,170	tons
12,800 engine-hours at 900 lb.	5 140	,,
16,800 banked-boiler-hours at 448 lb. ...	3,330	,,
	26,640	,,
Discrepancy factor (1·25) ...	1 25	,,
Total	33,300	tons

= 3·55 lb. per unit generated.

Overall thermo-dynamic efficiency = 7·4 per cent.

The no-load losses of a 1,500-KW. gas engine amount to 800 lb. of coal per hour and the useful output consumption to 1 lb. per unit generated. The total engine-hours would be 17,450 hours per annum, and banked producer-hours would be 35,000 hours per annum.

The total coal consumption for the gas plant will therefore be as follows:—

21,000,000 units at 1 lb. coal	9,360	tons
17,450 engine-hours at 800 lb.	6,230	,,
35,000 banked-producer-hours at 50 lb. ...	782	,,
	16,372	,,
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Total	20,465	tons

= 2·18 lb. per unit generated.

Overall thermo-dynamic efficiency = 12 per cent.

It is estimated that approximately 71 per cent., or 14,580 tons of the total coal consumption would be gasified in the ammonia producers and would yield at least 586 tons of sulphate of ammonia. Estimating the value of this at £11 per ton, which is considerably less than its present market value, the sale of this by-product would yield £6,446 per annum.

One ton of sulphuric acid, costing 30s. per ton, is required for each ton of sulphate of ammonia, and the cost of bags for packing the ammonia is estimated at 1s. 6d. per ton. The cost of acid and bags will therefore be £922, reducing the total amount to be credited on account of sale of sulphate of ammonia to £5,524.

The cost of oil for the steam turbine plant is estimated at 0·003d. per KW.-hour generated.

The oil consumption for large gas-driven generators is stated, by different authorities, to be from 0·2 to 0·37 gallon per 1,000 H.P.-hours, the average cost of the oil used being 1s. 6d. per gallon. Taking the higher figure, the oil consumption per plant unit will be 0·74 gallon per hour, or ... ... £970 per annum.

The cost of the oil for the auxiliary plant is estimated at ... ... 200 ,,

£1,170 per annum.

The cost of waste and engine-room stores is estimated at 0·002d. per unit generated both for the steam plant and for the gas plant, thus bringing the total cost of oil, waste, and stores to £438 for the steam plant, or 0·005d. per unit, and to £1,345 for the gas plant, or 0·0154d. per unit.

Each steam unit requires 288,000 gallons of cooling water per hour, of which it is estimated 3 per cent. will be evaporated from the cooling towers. The water evaporation will, therefore, be 8,640 gallons per hour × 12,800 engine-hours, which at 6d. per 1,000 gallons = £2,760 per annum.

The cooling water required for the gas engines is found to be about 12 gallons per hour per kilowatt output; each 1,500-KW. plant will, therefore, require 18,000 gallons per hour. We have again assumed an evaporation of 3 per cent. The water evaporated from the engine cooling towers will thus be 540 gallons per engine-hour × 17,450 engine-hours = 9,500 thousand gallons per annum. The water consumption for the producers is estimated at 35,000 gallons per day = 12,700 thousand gallons per annum.

The total water for the gas plant will therefore be 22,200 thousand gallons at 6d. per 1,000 = £555.

The labour charges are calculated upon the assumption that the following staff would be required for the respective schemes:—

STEAM PLANT.

Three charge engineers at £3 per week ...	£9	0	0
Three switchboard attendants at 30s. per week	4	10	0
Four drivers at 35s. per week	7	0	0
Four assistant drivers or cleaners at 28s. per week	5	12	0
Three firemen at 35s. per week...	5	5	0
Nine boiler house and auxiliary plant hands at 30s. per week	13	10	0
Three men for unloading coal and removing ashes at 28s. per week...	4	4	0
	£49	1	0

Total labour charges per annum, £2,550.

GAS PLANT.

Three charge engineers at £3 per week ...	9	0	0
Three switchboard attendants at 30s. per week	4	10	0
Six drivers at 35s. per week	10	10	0
Five drivers at 30s. per week	7	10	0
Two cleaners at 28s. per week	2	16	0
Three producer hands at 35s. per week ...	5	5	0
Six producer hands at 28s. per week	8	8	0
Seven ammonia recovery hands at 30s. per week	10	10	0
Two men for unloading coal and removing ashes at 28s. per week	2	16	0
	£61	5	0

Total labour charges per annum, £3,180.

Maintenance and repairs is the most difficult item to estimate with any degree of accuracy for either the steam or gas plant. In the case of steam turbines, the principal risk appears to be that of the blades stripping.

With large gas engines the most serious risk is that of the fracture of the piston or of the cylinder liners. Troubles of this nature are, however, fast disappearing.

As far as the actual wear and tear of the moving parts is concerned, this will probably be smaller in a gas engine than in a steam turbine. Numbers of examples are recorded of large engines in Continental generating stations that have been running for 12 or 18 months without being opened out.

The repairs of generators would certainly be lower for a gas-driven plant than for a steam or turbine-driven plant.

One of the principal items in the maintenance of a steam station is that of the repairs of steam pipes, whereas the maintenance of pipe-work in connection with a gas station will obviously be extremely small. The principal liability of repairs to pipe-work appears to arise from the risk of the exhaust pipes being attacked by sulphuric acid if the water is allowed to mix with the exhaust gases and combine with the small percentage of sulphur in them.

The cost of producer repairs appears to be a very small item, and will undoubtedly be only a fraction of the cost of repairs to high-pressure steam boilers. The Power Gas Corporation estimate that the total cost of repairs to the entire producer plant, including the ammonia recovery appliances, shown in fig. 4, would not exceed on the average £500 per annum over a period of a number of years.

We are of opinion that the total cost of repairs for the 10,000-KW. gas-driven station including engines, generators, producers, all auxiliaries and buildings, would not exceed £4,000 per annum, or 0·046d. per unit generated.

We have also estimated the repairs and maintenance of the steam plant at the same rate as the gas plant, though we believe that this is a lower figure than has yet been obtained in any steam station over a period of several years.

The correct amount to allow for interest and depreciation on electric generating machinery is a somewhat debatable point. It is usual in preparing estimates for industrial plants to allow 10 per

cent., but Mr. Snell in his paper on "Cost of Electrical Power for Industrial Purposes," justifies the figure of 6¼ per cent.

As this point has a very important bearing on the comparison of steam and gas engine cost, we have in each case shown the comparative cost including these charges at 10 per cent., and alternatively at 6¼ per cent.

The total running costs of generating 21,000,0000 units under the above conditions will, we estimate, be respectively as follows:—

	Gas.	*Steam.*
Total cost of coal at 12s. per ton ...	£12,280	£19,968
Less sale of sulphate of ammonia ...	5,524	—
Net cost of coal	6,756	19,968
Oil, waste and stores	1,345	438
Water	555	2,550
Labour	3,180	2,590
Repairs	4,000	4,000
Interest and depreciation at 10 per cent. on capital	17,687	13,952
Total cost	£33,523	£43,668
Total cost per unit	0·383d.	0·498d.
Total cost, allowing 6¼ per cent. for interest and depreciation	£26,900	£38,428
Total cost per unit	0·306d.	0·438d.

The total cost (including 6¼ per cent. for interest and depreciation) of generating power by steam is 45 per cent. greater than the cost of generating power by gas.

In the particular case we have considered the conditions are more favourable to the use of gas engines than in many of the existing provincial municipal electric supply schemes in this country. There are at present only 15 public electric supply undertakings working at a load factor of over 24 per cent., though many more have load factors varying from 20 to 24 per cent. In many cases, too, a suitable coal can be obtained at less than 12s. per ton delivered at the works. We will therefore go to the opposite extreme, and consider the case of a generating station having the very poor load factor of 10 per cent., and able to obtain fuel at 8s. per ton. We will also assume that the maximum output is only 4,000 KW., and that the use of sulphate of ammonia recovery plant for a portion of the producer plant as in the scheme previously considered is not justifiable. Under these conditions, the saving in fuel effected by using gas engines is little more than sufficient to pay the 10 per cent. interest and depreciation charges on the higher capital outlay of the gas plant.

It has been suggested that for such conditions a combined gas and steam plant might be used, the gas plant being utilised for the long-hour portion of the load curve and the steam plant with its lower capital charges for the peak load.

The following table shows the estimated annual running costs with plants consisting respectively of—

A. Five 1,000-KW. steam turbo-generators.
B. Seven 700-KW. gas engines and generators.
C. Four 1,000-KW. steam turbo-generators and two 700-KW. gas engines.

Running cost, 4,000-KW. plant; 10 per cent. load factor.
Coal, 8s. per ton.

	A. *Steam.*	B. *Gas.*	C. *Combined.*
Coal	£3,916	£2,073	£2,791
Oil and waste	95	297	248
Water	710	100	170
Labour	2,400	2,500	2,745
Repairs	1,250	1,250	1,250
Interest and depreciation at 10 per cent.	7,452	9,578	8,639
	£15,823	£15,798	£15,843
Cost per unit generated	0·878d.	0·867d.	0·868d.
Total cost, including interest and depreciation at 6¼ per cent. ...	£13,037	£12,209	£12,608

It appears, therefore, that for the above conditions and a 10 per cent. charge for interest and depreciation, there is nothing to choose between the different types of plant as far as running cost is concerned, but with interest and sinking fund charges of 6¼ per cent. the combined station shows an overall economy of 3 per cent. over that of the steam plant and the all-gas plant an improved economy of 6 per cent. over the all-steam plant.

We have calculated on the same basis as above the total running costs per unit generated with coal at various prices, ranging from 2s. 6d. to 15s. per ton, and with load factors of 10, 15 and 24 per cent.

It is found that under no condition is it worth while, when putting down a new station, to install a combination of steam and gas plant. With non-recovery plant and coal above a certain price, gas plant is more economical, and below that price steam plant alone is more economical than either gas plant alone or combined steam and gas.

These remarks apply only to entirely new installations. There are, however, many existing installations equipped with comparatively inefficient plant, where a large economy would be effected by installing one or more gas engines, which would be used for the flat portion of the curve, the inefficient plant being retained for the peak load and standby.

If the size of the installation or the load factor permits of recovery plant being used, gas plant is more economical than steam plant, however low the price of coal.

APPENDICES.

German Gas-Driven Installations.

The waste gases from a large number of blast furnaces in the Westphalia district have, for some years, been utilised for generating electric power for use in the iron and steel works and other industrial works in the neighbourhood.

The output from one particular combination of this nature exceeds 50,000,000 electric units per annum. A portion of this total output is generated by steam-driven generators and the remainder by gas-driven generators, the respective plants being located in different works and under entirely separate supervision.

A few months ago, a committee, consisting of steam and gas experts, was appointed to closely investigate the total cost of generating power under the respective systems.

The steam plant tested consisted of one 8,250-H.P. (5,500-KW.) turbo three-phase alternator, and the gas plant of four 2,000-H.P. single tandem gas engines directly coupled to three-phase alternators.

Each installation was debited with a charge of 10 per cent. on the total capital outlay involved to cover depreciation, in addition to interest charges. These extremely liberal fixed charges would obviously tend to favour the steam plant with its lower capital charges.

The actual cost of labour, stores, and repairs was taken over a period of 18 months.

As the waste gases available were insufficient for the total power required, it was necessary to provide coal for the balance, and the value of the gas was, therefore, in each case taken as being equivalent to the cost of coal having a corresponding useful heating value.

The calorific value of the coal used was 11,800 B.TH.U. per lb., and it cost 11s. per ton delivered in works.

The boilers for the steam plant were coal fired, and the coal used was carefully measured day by day for a period of one month.

The gas consumption tests were also continued over one month under all conditions of load.

The average load factor throughout the test was 65 per cent.

The Committee finally reported that they found the total cost, including all capital charges, of generating power by gas plant, under the above conditions, was 0·25d. per unit, and by steam turbines 0·39d. per unit, the cost of generating by steam being 56 per cent. greater than by gas.

In view of this report the board—whose only interest is to supply the greatest output at the lowest cost—have resolved to install additional gas-driven generators, having an aggregate output of 35,000 H.P.

A considerable portion of the above output is sold to a public electricity supply distributing company at 0·42d. per unit.

As the result of inquiries sent to all public electric supply undertakings in this country having an output exceeding 7½ million units per annum, it appears that the average over-all thermodynamic efficiency, based upon 20 replies for steam, is 6·73 per cent.; and for gas (8 replies) 13·95 per cent.

Fatigue of Copper Pipes.

In a paper read before the North-East Coast Institution of Engineers and Shipbuilders on January 29th, Mr. J. M. Allan discussed the treatment of copper pipe during the process of manufacture, with a view to enabling it to resist fatigue, and after manufacture, to restore its original qualities. Under ordinary conditions the process of annealing over an open fire cannot be carried out to the best advantage, as some parts may be less highly heated than others, especially in the case of bent pipes, or may escape annealing altogether.

The probable result will be unequal accommodation to movement of the different parts, and concentration of stress at one place instead of its equal distribution. Tests carried out by the author lead him to the conclusion that such pipes should be annealed complete in a proper furnace, and quenched out rapidly after withdrawal. Pipes thus treated do not suffer any distortion, as the author has proved by trial. The annealing temperature should be a bright red, as shown by the effect on test strips, which were bent to and fro until cracked; those raised to the full temperature showed a very marked superiority over samples less effectually annealed. It is, however, of the utmost importance to avoid heating the copper in a deoxidising flame, as this completely ruins the nature of the metal—over five-sixths of its strength being lost; thus it is essential to maintain a good strong blast of air through the fire. The effect of applying successively increasing loads, reannealing after each increase, was to increase the elongation of the sample to over 100 per cent., the original ductility of the metal being completely restored by the annealing.

Manchester Electrical Exhibition Profits.—We are informed that at a meeting of the Executive Committee held on 16th inst., it was agreed that 20 per cent. of the amount paid for space should be returned to the exhibitors, and that 10 per cent. on the sums donated by the various Corporations and District Councils should be returned to them out of the profits of the above Exhibition. The remaining balance will be dealt with when the accounts are closed.

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Three men for unloading coal and removing ashes at 28s. per week...	4	4	0
	£49	1	0

Total labour charges per annum, £2,550.

GAS PLANT.

Three charge engineers at £3 per week ...	9	0	0
Three switchboard attendants at 30s. per week	4	10	0
Six drivers at 35s. per week	10	10	0
Five drivers at 30s. per week	7	10	0
Two cleaners at 28s. per week	2	16	0
Three producer hands at 35s. per week ...	5	5	0
Six producer hands at 28s. per week	8	8	0
Seven ammonia recovery hands at 30s. per week	10	10	0
Two men for unloading coal and removing ashes at 28s. per week	2	16	0
	£61	5	0

Total labour charges per annum, £3,180.

Maintenance and repairs is the most difficult item to estimate with any degree of accuracy for either the steam or gas plant. In the case of steam turbines, the principal risk appears to be that of the blades stripping.

With large gas engines the most serious risk is that of the fracture of the piston or of the cylinder liners. Troubles of this nature are, however, fast disappearing.

As far as the actual wear and tear of the moving parts is concerned, this will probably be smaller in a gas engine than in a steam turbine. Numbers of examples are recorded of large engines in Continental generating stations that have been running for 12 or 18 months without being opened out.

The repairs of generators would certainly be lower for a gas-driven plant than for a steam or turbine-driven plant.

One of the principal items in the maintenance of a steam station is that of the repairs of steam pipes, whereas the maintenance of pipe-work in connection with a gas station will obviously be extremely small. The principal liability of repairs to pipe-work appears to arise from the risk of the exhaust pipes being attacked by sulphuric acid if the water is allowed to mix with the exhaust gases and combine with the small percentage of sulphur in them.

The cost of producer repairs appears to be a very small item, and will undoubtedly be only a fraction of the cost of repairs to high-pressure steam boilers. The Power Gas Corporation estimate that the total cost of repairs to the entire producer plant, including the ammonia recovery appliances, shown in fig. 4, would not exceed on the average £500 per annum over a period of a number of years.

We are of opinion that the total cost of repairs for the 10,000-KW. gas-driven station including engines, generators, producers, all auxiliaries and buildings, would not exceed £4,000 per annum, or 0·046d. per unit generated.

We have also estimated the repairs and maintenance of the steam plant at the same rate as the gas plant, though we believe that this is a lower figure than has yet been obtained in any steam station over a period of several years.

The correct amount to allow for interest and depreciation on electric generating machinery is a somewhat debatable point. It is usual in preparing estimates for industrial plants to allow 10 per

cent., but Mr. Snell in his paper on "Cost of Electrical Power for Industrial Purposes," justifies the figure of 6¼ per cent.

As this point has a very important bearing on the comparison of steam and gas engine cost, we have in each case shown the comparative cost including these charges at 10 per cent., and alternatively at 6¼ per cent.

The total running costs of generating 21,000,0000 units under the above conditions will, we estimate, be respectively as follows:—

	Gas.	*Steam.*
Total cost of coal at 12s. per ton ...	£12,280	£19,968
Less sale of sulphate of ammonia ...	5,524	—
Net cost of coal	6,756	19,968
Oil, waste and stores	1,345	438
Water	555	2,550
Labour	3,180	2,590
Repairs	4,000	4,000
Interest and depreciation at 10 per cent. on capital	17,687	13,952
Total cost	£33,523	£43,668
Total cost per unit	0·383d.	0·498d.
Total cost, allowing 6¼ per cent. for interest and depreciation	£26,900	£38,428
Total cost per unit	0·306d.	0·438d.

The total cost (including 6¼ per cent. for interest and depreciation) of generating power by steam is 45 per cent. greater than the cost of generating power by gas.

In the particular case we have considered the conditions are more favourable to the use of gas engines than in many of the existing provincial municipal electric supply schemes in this country. There are at present only 15 public electric supply undertakings working at a load factor of over 24 per cent., though many more have load factors varying from 20 to 24 per cent. In many cases, too, a suitable coal can be obtained at less than 12s. per ton delivered at the works. We will therefore go to the opposite extreme, and consider the case of a generating station having the very poor load factor of 10 per cent., and able to obtain fuel at 8s. per ton. We will also assume that the maximum output is only 4,000 KW., and that the use of sulphate of ammonia recovery plant for a portion of the producer plant as in the scheme previously considered is not justifiable. Under these conditions, the saving in fuel effected by using gas engines is little more than sufficient to pay the 10 per cent. interest and depreciation charges on the higher capital outlay of the gas plant.

It has been suggested that for such conditions a combined gas and steam plant might be used, the gas plant being utilised for the long-hour portion of the load curve and the steam plant with its lower capital charges for the peak load.

The following table shows the estimated annual running costs with plants consisting respectively of—

A. Five 1,000-KW. steam turbo-generators.
B. Seven 700-KW. gas engines and generators.
C. Four 1,000-KW. steam turbo-generators and two 700-KW. gas engines.

Running cost, 4,000-KW. plant; 10 per cent. load factor.
Coal, 8s. per ton.

	A. *Steam.*	B. *Gas.*	C. *Combined.*
Coal	£3,916	£2,073	£2,791
Oil and waste	95	297	248
Water	710	100	170
Labour	2,400	2,500	2,745
Repairs	1,250	1,250	1,250
Interest and depreciation at 10 per cent.	7,452	9,578	8,639
	£15,823	£15,798	£15,843
Cost per unit generated	0·878d.	0·867d.	0·868d.
Total cost, including interest and depreciation at 6¼ per cent. ...	£13,037	£12,209	£12,608

It appears, therefore, that for the above conditions and a 10 per cent. charge for interest and depreciation, there is nothing to choose between the different types of plant as far as running cost is concerned, but with interest and sinking fund charges of 6¼ per cent. the combined station shows an overall economy of 3 per cent. over that of the steam plant and the all-gas plant an improved economy of 6 per cent. over the all-steam plant.

We have calculated on the same basis as above the total running costs per unit generated with coal at various prices, ranging from 2s. 6d. to 15s. per ton, and with load factors of 10, 15 and 24 per cent.

It is found that under no condition is it worth while, when putting down a new station, to install a combination of steam and gas plant. With non-recovery plant and coal above a certain price, gas plant is more economical, and below that price steam plant alone is more economical than either gas plant alone or combined steam and gas.

These remarks apply only to entirely new installations. There are, however, many existing installations equipped with comparatively inefficient plant, where a large economy would be effected by installing one or more gas engines, which would be used for the flat portion of the curve, the inefficient plant being retained for the peak load and standby.

If the size of the installation or the load factor permits of recovery plant being used, gas plant is more economical than steam plant, however low the price of coal.

APPENDICES.

German Gas-Driven Installations.

The waste gases from a large number of blast furnaces in the Westphalia district have, for some years, been utilised for generating electric power for use in the iron and steel works and other industrial works in the neighbourhood.

The output from one particular combination of this nature exceeds 50,000,000 electric units per annum. A portion of this total output is generated by steam-driven generators and the remainder by gas-driven generators, the respective plants being located in different works and under entirely separate supervision.

A few months ago, a committee, consisting of steam and gas experts, was appointed to closely investigate the total cost of generating power under the respective systems.

The steam plant tested consisted of one 8,250-H.P. (5,500-KW.) turbo three-phase alternator, and the gas plant of four 2,000-H.P. single tandem gas engines directly coupled to three-phase alternators.

Each installation was debited with a charge of 10 per cent. on the total capital outlay involved to cover depreciation, in addition to interest charges. These extremely liberal fixed charges would obviously tend to favour the steam plant with its lower capital charges.

The actual cost of labour, stores, and repairs was taken over a period of 18 months.

As the waste gases available were insufficient for the total power required, it was necessary to provide coal for the balance, and the value of the gas was, therefore, in each case taken as being equivalent to the cost of coal having a corresponding useful heating value.

The calorific value of the coal used was 11,800 B.TH.U. per lb., and it cost 11s. per ton delivered in works.

The boilers for the steam plant were coal fired, and the coal used was carefully measured day by day for a period of one month.

The gas consumption tests were also continued over one month under all conditions of load.

The average load factor throughout the test was 65 per cent.

The Committee finally reported that they found the total cost, including all capital charges, of generating power by gas plant, under the above conditions, was 0·25d. per unit, and by steam turbines 0·39d. per unit, the cost of generating by steam being 56 per cent. greater than by gas.

In view of this report the board—whose only interest is to supply the greatest output at the lowest cost—have resolved to install additional gas-driven generators, having an aggregate output of 35,000 H.P.

A considerable portion of the above output is sold to a public electricity supply distributing company at 0·42d. per unit.

As the result of inquiries sent to all public electric supply undertakings in this country having an output exceeding 7½ million units per annum, it appears that the average over-all thermodynamic efficiency, based upon 20 replies for steam, is 6·73 per cent.; and for gas (8 replies) 13·95 per cent.

Fatigue of Copper Pipes.

In a paper read before the North-East Coast Institution of Engineers and Shipbuilders on January 29th, Mr. J. M. Allan discussed the treatment of copper pipe during the process of manufacture, with a view to enabling it to resist fatigue, and after manufacture, to restore its original qualities. Under ordinary conditions the process of annealing over an open fire cannot be carried out to the best advantage, as some parts may be less highly heated than others, especially in the case of bent pipes, or may escape annealing altogether.

The probable result will be unequal accommodation to movement of the different parts, and concentration of stress at one place instead of its equal distribution. Tests carried out by the author lead him to the conclusion that such pipes should be annealed complete in a proper furnace, and quenched out rapidly after withdrawal. Pipes thus treated do not suffer any distortion, as the author has proved by trial. The annealing temperature should be a bright red, as shown by the effect on test strips, which were bent to and fro until cracked; those raised to the full temperature showed a very marked superiority over samples less effectually annealed. It is, however, of the utmost importance to avoid heating the copper in a deoxidising flame, as this completely ruins the nature of the metal—over five-sixths of its strength being lost; thus it is essential to maintain a good strong blast of air through the fire. The effect of applying successively increasing loads, reannealing after each increase, was to increase the elongation of the sample to over 100 per cent., the original ductility of the metal being completely restored by the annealing.

Manchester Electrical Exhibition Profits.—We are informed that at a meeting of the Executive Committee held on 16th inst., it was agreed that 20 per cent. of the amount paid for space should be returned to the exhibitors, and that 10 per cent. on the sums donated by the various Corporations and District Councils should be returned to them out of the profits of the above Exhibition. The remaining balance will be dealt with when the accounts are closed.

NEW ELECTRICAL DEVICES, FITTINGS, AND PLANT.

New Tongs.

The accompanying illustration shows an improved form of tongs, with which a firm grip can be obtained on tapered articles, the

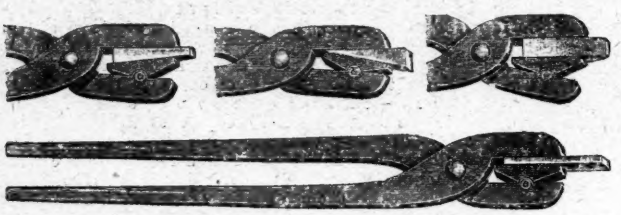


Fig. 4.—Tongs with Self-Adjusting Jaws.

movable piece in the lower jaw adapting itself to the shape of the article, as shown. This device is described by Mr. A. R. Hesse, Remscheid, in *Der Mechaniker*.

The "I.B.F." Automatic Ear.

In the accompanying view, fig. 1, we show the "I.B.F." patent automatic ear supplied by Messrs. Imeson, Finch & Co., Ltd., of Stockton-on-Tees. This ear has been in use for some considerable time in several of the largest works in the country which have adopted the overhead system, and we understand that it has given great satisfaction. The ears have also been tried and tested on the Stockton Tramways with, we understand, good results. It is claimed that the ear can be placed in position in half the time of the mechanical ear, and in case of breakdowns it is indispensable. We are informed that it is now upon the market at practically the same price as the ordinary mechanical ears.

It is manufactured in all sizes and to suit all gauges of wire, is

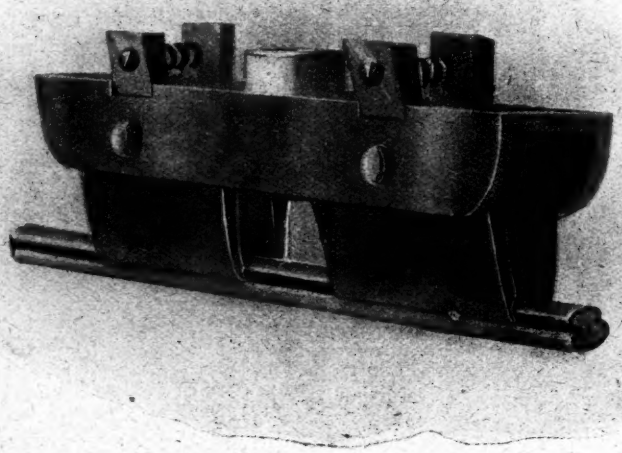


Fig. 1.—The "I.B.F." Automatic Ear.

simple in design, and acts automatically by means of spring clips. The trolley wire is immediately placed into position or released by compressing the projections which open the clips.

The "Abbey" Flame Arc Lamp.

This lamp is of the converging-carbon type, and has the differential control magnets common to most arc lamps, but is otherwise distinctive in the form of release mechanism adopted for the feeding of the carbons. The carbon holders are suspended by copper flexible cords, which pass over a drum attached to a ratchet wheel pivoted between the two solenoids. This ratchet wheel, and a double-toothed catch, moved up or down by the action of the solenoids, are practically the only moving parts in the lamp. From the accompanying diagram (fig. 2) it will be clearly seen now the action of this catch and ratchet wheel allows the carbons to be fed down a distance equal to one tooth on the ratchet, each time the pull of the shunt-coil overcomes that of the series. It is impossible for the carbons to be affected by vibration, as they cannot run down or be shaken down beyond the one tooth required. By this means also the arc is kept well inside the furnace or economiser, when burning, as every feed takes place when the carbons are in a fixed position in the furnace; as this

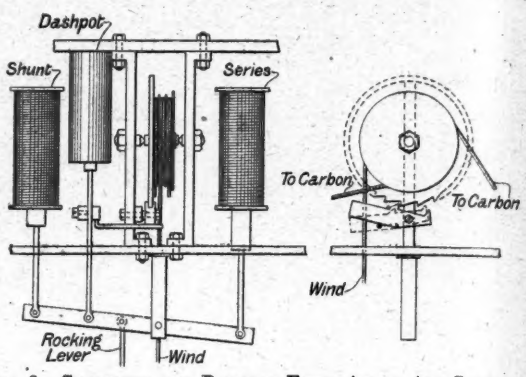


Fig. 2.—Solenoids and Ratchet Feed, Abbey Arc Lamp.

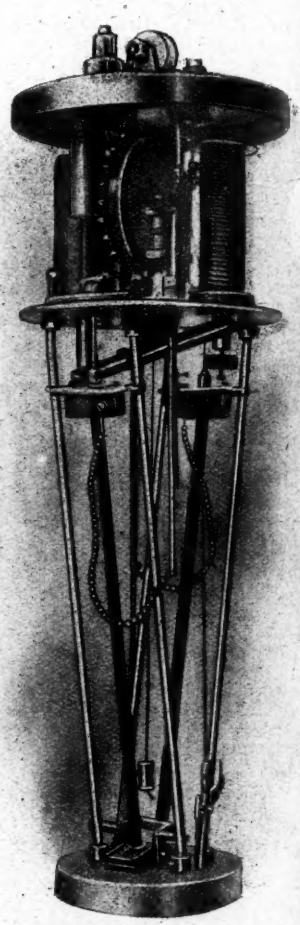


Fig. 3.—Mechanism of the Abbey Lamp, with Casing Removed.

position never alters, provided that no draught is allowed to get to the arc, a steady and even light is assured. The arc itself is controlled by a slide worked from the rocking lever, and special care has been taken to make this slide free from all chance of sticking owing to unnecessary friction, &c.

There is no "blow-magnet" in the lamp, as no such device has been found necessary when the arc is kept well inside the economiser.

The economiser and bottom plate are cast in one piece of cast-iron, thus doing away with any chance of cracking with the heat. The lamp automatically protects itself when the carbons are burnt out, and no harm would result if the switch was accidently left closed.

The case of this lamp is also a special feature, the bottom cylinder being fastened to the top chamber by a pair of clips of a new design, which are hardly noticeable, and very easy to detach for lowering. The globe is wired on to a deep ring which fixes into the bottom case with a bayonet-joint fitting, and can easily be removed with one hand, thus making the lamp very easy to trim and also of neat appearance. The top chamber, which contains the

mechanism, is protected from the fumes arising from the arc by an iron plate, over the edge of which the top cylinder of the case fits tightly with a narrow flange.

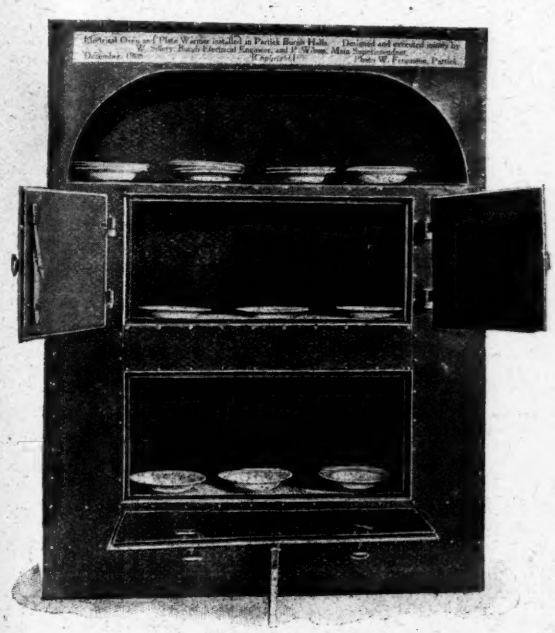
Special attention has been paid to ventilation, in order to get rid of the fumes. Thus a small amount of air is allowed to enter at the bottom of the globe round the ash-tray. The fumes then pass up into the bottom cylinder, where there is a ring of holes just above the copper spinning. Finally, a space of about a quarter of an inch is left at the top of the bottom cylinder just under the copper spinning. There is also sufficient ventilation provided in the top chamber to keep the coils cool.

The lamp is made in two sizes to burn for 12 and 20 hours respectively with one pair of carbons, the length being about 36 in. in the case of the short lamp and about 47 in. in the long one, overall. The porcelain insulator at the top of the lamp is fitted in a neat hinge arrangement, so as to be able to swing in any direction in the wind, without disfiguring the general appearance.

The chief aim in designing this lamp has been to make it as simple as possible, and to combine efficiency and durability with the least possible amount of mechanism. It is made by the ABBEY ELECTRIC Co., of 17, Victoria Street, Westminster.

Largest Electric Oven in the Kingdom.

MR. W. SILLERY, burgh electrical engineer of Partick, has sent us particulars and photographs of an electric oven and plate warmer, jointly constructed by himself and MR. P. WILSON, mains superintendent. It has been made especially for the burgh halls and the public generally, and has been in constant use since December last, proving in practice most satisfactory and economical and perfectly under control. The maximum energy consumption



[FIG. 5.—LARGE ELECTRIC OVEN, CONSTRUCTED BY MESSRS. SILLERY AND WILSON, PARTICK.

of the oven when in use is 3½ units per hour, and it is constructed so that no more than 6 units can possibly be consumed per hour. The size of the oven overall is 6 ft. high × 4 ft. 8 in. wide × 32 in.; there are two indepe dent ovens, for roasting or baking, and a plate warmer upon the top portion. Inside size of oven (top), 4 ft. 3½ in. × 1 ft. 10⅝ in × 17 in.; door opening (top), 2 ft. 10 in. × 1 ft. 2 in.; inside size of oven (bottom), 4 ft. 3½ in. × 1 ft. 10⅝ in. × 14⅝ in.; door opening (bottom), 2 ft. 10 in. × 1 ft. 2 in.

Mr. Sillery informs us that electricity can successfully compete with other methods of cooking and heating; the cost, at 1d. per unit, the price at Partick, is much below that which gas can ever hope to attain, apart from the cleanliness, safety and convenience of the former.

The inventors have not patented any portion of the oven, and are only interested in it from a central-station engineer's point of view—to sell current.

Electrical Resistances.

A simple form of resistance unit has been introduced by MR. MAX HANKIN, of 38, Guilford Street, Russell Square, W.C. It consists essentially of a semi-conducting material such as a mixture of metallic particles and non-conducting matter, enclosed in a metallic capsule, into which insulated electrodes are brought to make contact with the mixture. The latter may, for example, be made of nearly equal parts of granulated cast-iron and refractory earth, with a small admixture of plumbago and asbestos fibre. This is well moistened with water and exposed to the air, to coat the iron particles with a layer of oxide, before filling the capsules. Though the latter are made of cast-iron, they do not short-circuit the material, the electrodes being brought well into the latter. Owing to the nature of the material, the resistance is great at first and diminishes as the current flows, thus affording an advantageous means of starting arc lamps, motors, &c. One of the forms in

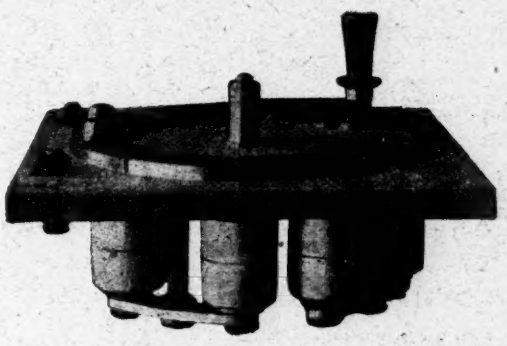


FIG. 6.—HANKIN AND WOLFF'S PATENT RHEOSTAT.

which the units are employed as a rheostat is shown in the accompanying figure. Various other forms are made.

FOREIGN AND COLONIAL TARIFFS ON ELECTRICAL GOODS.

PROPOSED NEW FRENCH TARIFF.

(*Concluded from page* 327.)

	Present tariff. Fcs. per 100 kg.	Proposed tariff. Fcs. per 100 kg.
Pumps and ventilators, weighing—		
Over 3,000 kg. and containing at least 50 per cent. of cast-iron	8	10
Less than 50 per cent. of cast-iron	10	12
From 250 to 3,000 kg.	10	12
Less than 250 kg.	15	18
Machine tools—		
Heavy, weighing over 5,000 kg.	10	23
„ „ 1,000 kg. and up to 5,000 kg.		28
Medium, „ „ 250 kg. and up to 1,000 kg.	16	36
Small and of precision, weighing 100 to 250 kg.	50	50
Less than 100 kg.		60
Parts of turbines (steam, gas, petrol, &c.), with or without fittings of other metal	not specified	50
Wires and insulated cables for electricity, composed of cores of iron, steel, copper, or an alloy of copper, covered with—	not specified as such	
Silk or cotton to the exclusion of all other materials if the metal core has a diameter of—		
Equal to or greater than $\frac{5}{10}$ mm.		40
Less than $\frac{5}{10}$ mm.		60
Silk in combination with caoutchouc or gutta-percha		100
Caoutchouc, or gutta-percha, alone or in combination with materials other than silk, without a protecting covering of metal		70
Hemp, jute, cotton, asbestos, or other materials to the exclusion of caoutchouc and gutta-percha, without a protecting covering of metal		40
Of any insulating substance provided that it is protected by one or more metal sheaths of lead, iron, steel wire, &c.		40
Lead pipes, weighing 50 grammes or more, per piece	6·50	6·50
Lead pipes, weighing less than 50 grammes, per piece		10
Dry electric batteries	not specified	40
Threads of vulcanised india-rubber	40	20
Asbestos, paper or cardbox, in rolls or rectangular form, not made up	50	25
Made up, cut out, in forms other than rectangular, with or without threads, cloths, or metallic pieces		50
Threads, plain or twisted, combined or not with other materials, glazed or not		50
Plaits and cords, with or without textile and metallic materials, and tissues of 1 kg. and over, per sq. metre		70
Tissues of the same materials under 1 kg., per sq. metre		80
Articles made up in cardboard, threads or tissues, clothing, &c.		100

NEW ELECTRICAL DEVICES, FITTINGS, AND PLANT.

New Tongs.

The accompanying illustration shows an improved form of tongs, with which a firm grip can be obtained on tapered articles, the

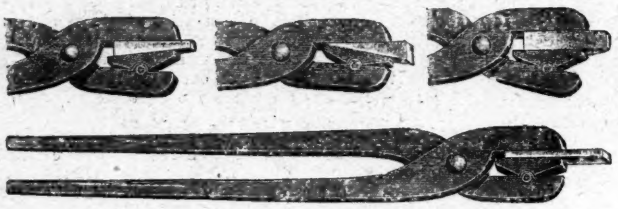


FIG. 4.—TONGS WITH SELF-ADJUSTING JAWS.

movable piece in the lower jaw adapting itself to the shape of the article, as shown. This device is described by Mr. A. R. Hesse, Remscheid, in *Der Mechaniker*.

The "I.B.F." Automatic Ear.

In the accompanying view, fig. 1, we show the "I.B.F." patent automatic ear supplied by MESSRS. IMESON, FINCH & CO., LTD., of Stockton-on-Tees. This ear has been in use for some considerable time in several of the largest works in the country which have adopted the overhead system, and we understand that it has given great satisfaction. The ears have also been tried and tested on the Stockton Tramways with, we understand, good results. It is claimed that the ear can be placed in position in half the time of the mechanical ear, and in case of breakdowns it is indispensable. We are informed that it is now upon the market at practically the same price as the ordinary mechanical ears.

It is manufactured in all sizes and to suit all gauges of wire, is

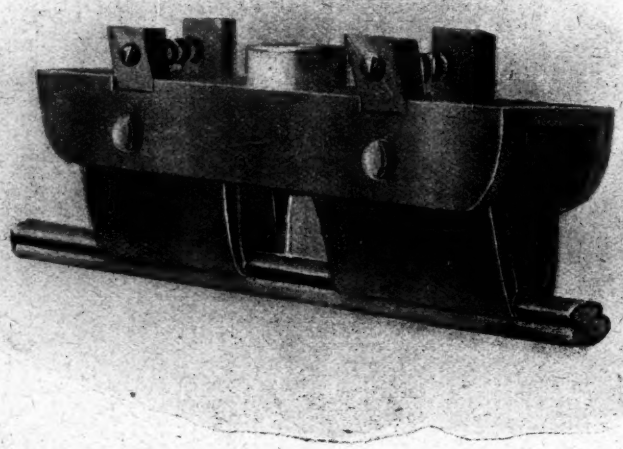


FIG. 1.—THE "I.B.F." AUTOMATIC EAR.

simple in design, and acts automatically by means of spring clips. The trolley wire is immediately placed into position or released by compressing the projections which open the clips.

The "Abbey" Flame Arc Lamp.

This lamp is of the converging-carbon type, and has the differential control magnets common to most arc lamps, but is otherwise distinctive in the form of release mechanism adopted for the feeding of the carbons. The carbon holders are suspended by copper flexible cords, which pass over a drum attached to a ratchet wheel pivoted between the two solenoids. This ratchet wheel, and a double-toothed catch, moved up or down by the action of the solenoids, are practically the only moving parts in the lamp. From the accompanying diagram (fig. 2) it will be clearly seen now the action of this catch and ratchet wheel allows the carbons to be fed down a distance equal to one tooth on the ratchet, each time the pull of the shunt-coil overcomes that of the series. It is impossible for the carbons to be affected by vibration, as they cannot run down or be shaken down beyond the one tooth required. By this means also the arc is kept well inside the furnace or economiser, when burning, as every feed takes place when the carbons are in a fixed position in the furnace; as this

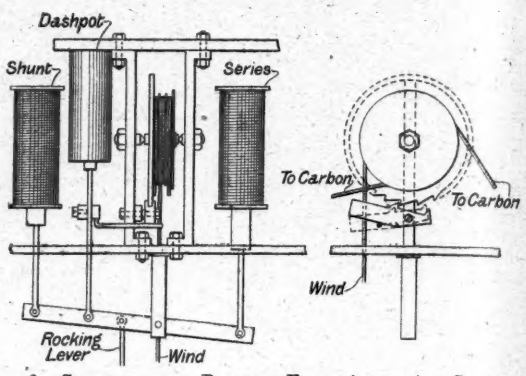


FIG. 2.—SOLENOIDS AND RATCHET FEED, ABBEY ARC LAMP.

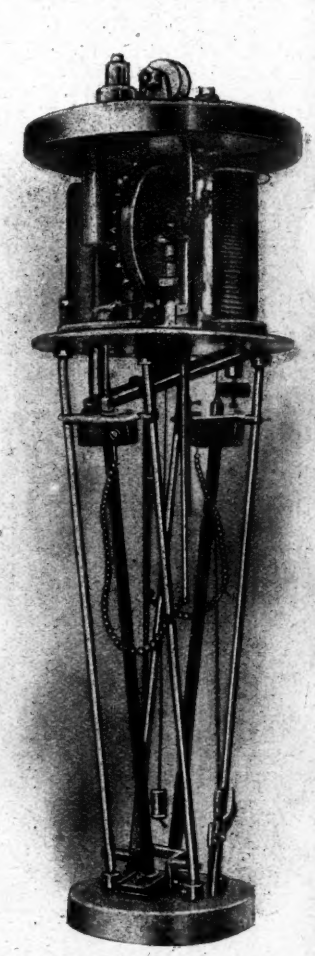


FIG. 3.—MECHANISM OF THE ABBEY LAMP, WITH CASING REMOVED.

position never alters, provided that no draught is allowed to get to the arc, a steady and even light is assured. The arc itself is controlled by a slide worked from the rocking lever, and special care has been taken to make this slide free from all chance of sticking owing to unnecessary friction, &c.

There is no "blow-magnet" in the lamp, as no such device has been found necessary when the arc is kept well inside the economiser.

The economiser and bottom plate are cast in one piece of cast-iron, thus doing away with any chance of cracking with the heat. The lamp automatically protects itself when the carbons are burnt out, and no harm would result if the switch was accidently left closed.

The case of this lamp is also a special feature, the bottom cylinder being fastened to the top chamber by a pair of clips of a new design, which are hardly noticeable, and very easy to detach for lowering. The globe is wired on to a deep ring which fixes into the bottom case with a bayonet-joint fitting, and can easily be removed with one hand, thus making the lamp very easy to trim and also of neat appearance. The top chamber, which contains the

mechanism, is protected from the fumes arising from the arc by an iron plate, over the edge of which the top cylinder of the case fits tightly with a narrow flange.

Special attention has been paid to ventilation, in order to get rid of the fumes. Thus a small amount of air is allowed to enter at the bottom of the globe round the ash-tray. The fumes then pass up into the bottom cylinder, where there is a ring of holes just above the copper spinning. Finally, a space of about a quarter of an inch is left at the top of the bottom cylinder just under the copper spinning. There is also sufficient ventilation provided in the top chamber to keep the coils cool.

The lamp is made in two sizes to burn for 12 and 20 hours respectively with one pair of carbons, the length being about 36 in. in the case of the short lamp and about 47 in. in the long one, overall. The porcelain insulator at the top of the lamp is fitted in a neat hinge arrangement, so as to be able to swing in any direction in the wind, without disfiguring the general appearance.

The chief aim in designing this lamp has been to make it as simple as possible, and to combine efficiency and durability with the least possible amount of mechanism. It is made by the ABBEY ELECTRIC Co., of 17, Victoria Street, Westminster.

Largest Electric Oven in the Kingdom.

MR. W. SILLERY, burgh electrical engineer of Partick, has sent us particulars and photographs of an electric oven and plate warmer, jointly constructed by himself and MR. P. WILSON, mains superintendent. It has been made especially for the burgh halls and the public generally, and has been in constant use since December last, proving in practice most satisfactory and economical and perfectly under control. The maximum energy consumption

[FIG. 5.—LARGE ELECTRIC OVEN, CONSTRUCTED BY MESSRS. SILLERY AND WILSON, PARTICK.

of the oven when in use is 3½ units per hour, and it is constructed so that no more than 6 units can possibly be consumed per hour. The size of the oven overall is 6 ft. high × 4 ft. 8 in. wide × 32 in.; there are two independent ovens, for roasting or baking, and a plate warmer upon the top portion. Inside size of oven (top), 4 ft. 3½ in. × 1 ft. 10⅝ in × 17 in.; door opening (top), 2 ft. 10 in. × 1 ft. 2 in.; inside size of oven (bottom), 4 ft. 3½ in. × 1 ft. 10⅝ in. × 14⅝ in.; door opening (bottom), 2 ft. 10 in. × 1 ft. 2 in.

Mr. Sillery informs us that electricity can successfully compete with other methods of cooking and heating; the cost, at 1d. per unit, the price at Partick, is much below that which gas can ever hope to attain, apart from the cleanliness, safety and convenience of the former.

The inventors have not patented any portion of the oven, and are only interested in it from a central-station engineer's point of view—to sell current.

Electrical Resistances.

A simple form of resistance unit has been introduced by MR. MAX HANKIN, of 38, Guilford Street, Russell Square, W.C. It consists essentially of a semi-conducting material such as a mixture of metallic particles and non-conducting matter, enclosed in a metallic capsule, into which insulated electrodes are brought to make contact with the mixture. The latter may, for example, be made of nearly equal parts of granulated cast-iron and refractory earth, with a small admixture of plumbago and asbestos fibre. This is well moistened with water and exposed to the air, to coat the iron particles with a layer of oxide, before filling the capsules. Though the latter are made of cast-iron, they do not short-circuit the material, the electrodes being brought well into the latter. Owing to the nature of the material, the resistance is great at first and diminishes as the current flows, thus affording an advantageous means of starting arc lamps, motors, &c. One of the forms in

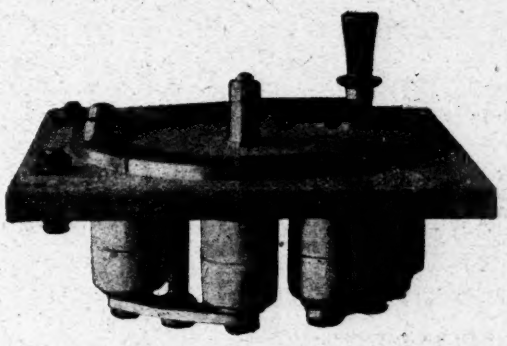


FIG. 6.—HANKIN AND WOLFF'S PATENT RHEOSTAT.

which the units are employed as a rheostat is shown in the accompanying figure. Various other forms are made.

FOREIGN AND COLONIAL TARIFFS ON ELECTRICAL GOODS.

PROPOSED NEW FRENCH TARIFF.

(*Concluded from page* 327.)

	Present tariff. Fcs. per 100 kg.	Proposed tariff. Fcs. per 100 kg.
Pumps and ventilators, weighing—		
Over 3,000 kg. and containing at least 50 per cent. of cast-iron	8	10
Less than 50 per cent. of cast-iron ...	10	12
From 250 to 3,000 kg.	10	12
Less than 250 kg.	15	18
Machine tools—		
Heavy, weighing over 5,000 kg.	10	23
" " 1,000 kg. and up to 5,000 kg. ...		28
Medium, " " 250 kg. and up to 1,000 kg. ...	16	36
Small and of precision, weighing 100 to 250 kg.	50	50
Less than 100 kg.		60
Parts of turbines (steam, gas, petrol, &c.), with or without fittings of other metal...	not specified	50
Wires and insulated cables for electricity, composed of cores of iron, steel, copper, or an alloy of copper, covered with—		
Silk or cotton to the exclusion of all other materials if the metal core has a diameter of—		
Equal to or greater than $\frac{1}{10}$ mm. ...		40
Less than $\frac{5}{10}$ mm.		60
Silk in combination with caoutchouc or gutta-percha	not specified as such	100
Caoutchouc, or gutta-percha, alone or in combination with materials other than silk, without a protecting covering of metal		70
Hemp, jute, cotton, asbestos, or other materials to the exclusion of caoutchouc and gutta-percha, without a protecting covering of metal		40
Of any insulating substance provided that it is protected by one or more metal sheaths of lead, iron, steel wire, &c.		40
Lead pipes, weighing 50 grammes or more, per piece	6·50	6·50
Lead pipes, weighing less than 50 grammes, per piece		10
Dry electric batteries	not specified	40
Threads of vulcanised india-rubber	40	20
Asbestos, paper or cardbox, in rolls or rectangular form, not made up	50	25
Made up, cut out, in forms other than rectangular, with or without threads, cloths, or metallic pieces		50
Threads, plain or twisted, combined or not with other materials, glazed or not ...		50
Plaits and cords, with or without textile and metallic materials, and tissues of 1 kg. and over, per sq. metre		70
Tissues of the same materials under 1 kg., per sq. metre		80
Articles made up in cardboard, threads or tissues, clothing, &c.		100

NEW PATENTS APPLIED FOR, 1909.

Compiled expressly for this journal by W. P. Thompson & Co., Electrical Patent Agents, 322, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.

2,959. "Improvements in dynamos and motors." E. Turner. February 8th. (Complete.)

2,984. "Thermic safety sparking plugs for internal combustion engines." W. V. Williams. February 8th.

3,002. "Improvements in or connected with electric tramways or railways." D. Thompson. February 8th.

3,004. "Improvements in electric switches." Electric Ignition Co., Ltd., and G. N. Hall. February 8th.

3,028. "Electric water heater." W. F. Cutler and T. Barnett. February 8th. (Complete.)

3,046. "Improvements relating to alternating electric current distribution systems." J. S. Peck, K. M. Faye-Hanson and S. Lustgarten. February 8th.

3,059. "Improvements in electrically driven capstans or winches." W. H. Scott. February 8th.

3,105. "Improvements in switches, adapters and wiring connections for controlling two lamps." Simplex Conduits, Ltd., and W. T. Elliott. February 9th.

3,106. "Improvements in watertight switches." Simplex Conduits, Ltd., and L. M. Waterhouse and E. Sheppard. February 9th.

3,130. "The earthing of all non-conducting parts of electrical tumbler switches." J. B. Belcher. February 9th.

3,160. "Improvements in electric switches." G. W. Hawker. February 9th.

3,174. "Improvements in or relating to starting devices for electric motors." K. R. Odman. February 9th.

3,176. "Improvements in or relating to automatic electric switches for use with auto-transformers." F. C. Dunnatt. February 9th.

3,191. "Improvements in electrical resistances." A. H. Curtis and Adams Manufacturing Co., Ltd. February 9th.

3,192. "Improvements in and relating to protective devices for power transmission systems." British Thomson-Houston Co., Ltd., and E. B. Wedmore. February 9th.

3,199. "Magneto-ignition apparatus for multi-cylinder internal combustion engines." W. P. Thompson. (Mesfabrik Magnet Elektrischer Apparate G.m.b.H., Germany.) February 9th. (Complete.)

3,217. "Improvements in prepayment electricity meters." G. Hookham and S. H. Holden. (Application for Patents of Addition to No. 2,769/08.) February 10th.

3,232. "Improvements in electric switches." A. Willis. February 10th.

3,249. "Draught, dust, and weather excluder with electric bell alarm." E. Spencer. February 10th.

3,250. "Improved shade carrier as applied to electric lampholders." W. Green. February 10th.

3,252. "Improvements in electric flash lamps." W. D. Whyte. February 10th.

3,280. "Improvements in life guards for electrical tramcars and the like vehicles." H. W. Johnson and W. Steele-Brown. February 10th. (Complete.)

3,300. "Improvements in or relating to electricity motors." G. North. February 10th.

3,301. "Improvements in mechanism for controlling parts like valves, ignition devices or detents." Bachrich & Co. (Date applied for under Sec. 91 of the Act September 19th, 1908, being date of application in Germany.) (Application for Patent of Addition to No. 23,361/08.) February 10th. (Complete.)

3,309. "Improved combined telephone call card and advertising device." W. J. Ainge. February 10th.

3,311. "Improvements in and relating to electrical wiring for houses and the like." F. A. Wilkinson. February 10th.

3,314. "Improved ignition apparatus for carriage and other like lamps." J. McGeown. February 10th.

3,333. "Improvements in self-regulating generators and motors." W. Lulofs and J. D. Coales. February 11th.

3,340. "Electrical printing telegraph." K. P. Bronee. (Date applied for under Sec. 91 of the Act, February 11th, 1908, being date of application in Germany.) February 11th. (Complete.)

3,352. "Improvements in dynamo-electric machines." F. W. Carter. February 11th.

3,369. "Improvements in and relating to signalling on electric tramways and railways." J. Roberts. February 11th.

3,371. "Improvements in arc lamps." A. Holman. February 11th. (Application for Patent of Addition to No. 27,686 of 1908.)

3,381. "Electrical alarm clock and indicator." H. F. Schmidt. February 11th.

3,386. "Improvements in antiseptic telephone caps." J. A. O'Leary. February 11th.

3,397. "Improvements in and relating to apparatus for the transmission of electrical impulses for telegraphy, type-setting and the like." H. Knudsen. February 11th.

3,437. "Improvements in electric-driven mechanism, especially, though not exclusively, applicable for driving secondary electric clocks." J. Heale and E. Powell. February 11th. (Complete.)

3,469. "Improvements in and connected with ignition devices for internal combustion engines." T. G. Smith. February 12th.

3,486. "Rotary electric switch, mechanically operated by and mechanically coupled to a machine driven by an electric motor, the electric control of which it is desired to effect." W. Holmes. February 12th.

3,511. "Improvements in armatures for magneto induction machines." The Firm R. Bosch. (Date applied for under Sec. 91 of the Act, November 20th, 1908, being date of application in Germany.) February 12th. (Complete.)

3,513. "Improvements in electric arc lamps." R. C. Dieppe and W. T. Knoll, trading as Universal Electrical Manufacturing Co. February 12th.

3,517. "Improvements in multiple switch starting devices for electric motors." H. W. Lake. (Cutler Hammer Manufacturing Co., United States.) February 12th. (Complete.)

3,518. "Improvements in and connected with electrical switches." R. W. J. Holloway and H. R. Tanner. February 12th.

3,533. "Improvements in control systems for electric motors." J. S. Peck. February 12th.

3,539. "Switchboard equipments for telephone exchanges." F. F. V. Johannsen. February 12th. (Complete.)

3,545. "Improved device for transforming continuous electricity into alternating electricity." J. W. Ewart. February 13th.

3,547. "Improved guard or shield for insulators of telegraph and telephone line wires." W. E. Bandfield. February 13th.

3,554. "Improvements in electric radiators and other apparatus where banks of massed lamps or other radiating devices are used." W. Fennell and W. P. Perry. February 13th.

3,556. "Improvements in electric lampholders." W. Fennell and W. P. Perry. February 13th.

3,560. "Improvements in electrical controllers." J. B. Tannahill. February 13th.

3,573. "Improvements in alarm fuses for telephone exchanges." H. Cooper and The British Insulated & Helsby Cables, Ltd. February 13th.

3,574. "Improvements relating to electro-magnetic chucks and the like." W. H. Heath. February 13th.

3,576. "Improvements in conductors and collector apparatus for electrically operated and electrically impelled locomotive cranes, applicable also to other electrically operated machines." N. Hope and T. W. Ward, Ltd. February 13th.

3,588. "Improvements in means for automatically regulating or controlling the current and speed of electric motors for rolling mills and the like." Societe Anonyme Dougree Marihaye and F. Courtoy. February 13th. (Complete.)

3,599. "Improvements in electrical induction furnaces." C. Grunwald. (Date applied for under Sec. 91 of the Act, May 7th, 1908, being date of application in Germany.) February 13th. (Complete.)

3,603. "Improvements in apparatus for coating metal." H. Roberts. February 13th. (Complete.)

3,604. "Improvements in coating metal surfaces with other metals." A. Sang. February 13th. (Complete.)

3,618. "Improvements in and connected with low tension ignition contrivances of internal combustion engines." A. Gray. February 13th.

3,621. "Automatic electric contact-making and braking device." M. Peaucellier. (Date applied for under Sec. 91 of the Act, May 4th, 1908, being date of application in Germany.) February 13th. (Complete.)

3,626. "Improvements in the electrodeposition of metals." S. O. Cowper-Coles. February 13th.

3,628. "Improvements in electric switches." W. H. Flood. February 13th.

PUBLISHED SPECIFICATIONS.

Copies of any of these Specifications may be obtained of Messrs. W. P. Thompson & Co., 322, High Holborn, W.C., and at Liverpool and Bradford; price, post free, 9d. (in stamps).

1907.

Electric Battery Sub-Stations Fed from Alternating-Current Systems. A. M. Taylor. 22,581. October 14th. (Cognate applications Nos. 26,381/07 and 1,734/08.)

Direct-Current Machines for Varying the Difference of Potential at Two Points of a Circuit between which Practically Constant Electric Current is to be Maintained. Felten & Guilleaume Lahmeyerwerke Akt.-Ges.) 25,744. November 20th. (Date applied for under International Convention, November 26th, 1906.)

26/381. See 22,581/07 above.

1908.

Secondary or Storage Batteries. H. W. Lake. (C. H. Clare, United States.) 1,005. January 15th.

Gas Burners and Electrical Devices for Controlling, Igniting and Extinguishing the Gas from a Distance. H. L. Down and Telephos, Ltd. 1,453. January 21st.

Arc Lamps. H. E. Moul. 1,596. January 23rd.

1,731. See 22,581/07 above.

Starting Devices for Electric Motors for Use in Connection with Automatic Organ-Blowing Apparatus. F. Taylor. 2,295. February 1st.

Incandescent Electric Lamps. J. Howard. 2,707. February 6th.

Electric Accumulators. Van Raden & Co. and M. Metz. 2,727. February 6th.

Electrodes for Secondary Batteries and the Manufacture of the Same. Van Raden & Co., C. B. Robinson and M. Metz. 2,728. February 6th. (Application for Patent of Addition to No. 21,719/06.)

Metallic Conduits as Employed for Electric Wiring. J. R. Browne and T. Bayliss. 6,331. March 21st.

Electric Circuit Breakers or Makers. J. G. Statter. 6,568. March 24th. (Request under Sec. 19 not granted.)

Timing and Recording Devices for Electric Discharges. F. H. Glew. 7,261. April 2nd.

Production of Electrical Discharge. W. E. Evans. (Elektrochemische Werke.) 8,425. April 15th.

Means for Ventilating or Cooling Laminated Iron Cores Carrying a Magnetic Flux, whose Principal or Only Component is a Simple Alternating Flux. A. R. Low. 8,997. April 25th.

Lenses for Bull's Eyes and like Electric Lamps. W. Burns and Sylverlyte Electric Lamp Co., Ltd. 10,696. May 16th.

Dynamo-Electric Machines. British Thomson-Houston Co. (Allgemeine Elektricitäts Ges.) 11,161. May 22nd.

Electrical Socks. C. H. Hooper and H. H. Hooper. 12,987. June 18th.

Arc Lamps. H. Miertschke. 13,100. June 19th.

Electrically-Actuated Devices for Locking the Doors of Railway Carriages, Tramway and like Vehicles. S. A. M. Rose and C. F. Kennedy. 14,607. July 9th.

Time Limit Relays for Use in Electric Circuits. Siemens & Halske Akt.-Ges. 15,742. July 24th. (Date applied for under International Convention, October 8th, 1907.)

Electromagnetic Device for Cushioning Blows. G. H. Rowe. 15,874. July 25th.

Method of Indicating Faults in the Circuits of Electrical Transmission Systems. Siemens Bros. & Co. (Siemens & Halske Akt.-Ges.) 15,898. July 27th.

System of Telegraphy. A. M. Dean. 15,940. July 29th.

Electrical Condensers. G. E. Gaiffe. 16,585. August 5th. (Date applied for under International Convention, February 8th, 1908.)

Electric Arc Lamps. Körting & Mathieson Akt.-Ges. 17,491. August 19th. (Date applied for under International Convention, August 20th, 1907.)

Sanitary Attachments for Telephone Transmitters and Receivers. F. Schilling. 17,531. August 20th.

Electric Switches. F. Lilling. 17,752. August 24th. (Date applied for under International Convention, August 31st, 1907.)

Electrical Method of Transmitting Movements Due to a Small Expenditure of Energy. H. Koepsel. 18,238. August 31st. (Date applied for under International Convention, September 3rd, 1907.)

Commutating Devices for Dynamo-Electric Machines. British Thomson-Houston Co. (Allgemeine Elektricitäts Ges.) 18,400. September 2nd.

Electric Fire Alarms. R. Cass. 18,787. September 7th.

Supports for Filaments of Incandescent Electric Lamps. F. R. Pope and M. W. O'Connell. 19,052. September 10th.

Trolley Heads for Electric Traction. T. Bailey. 19,337. September 11th.

Process for Making Incandescent Filaments for Electric Lamps. W. P. Thompson. (Von Inwold and von Inwold, Austria.) 19,659. September 13th.

Closed Circuit Signal Installations. Siemens Bros. & Co. (Siemens and Halske Akt.-Ges.) 23,409. October 22nd.

Electric Signalling Apparatus. J. H. Carstens. 24,052. November 10th.